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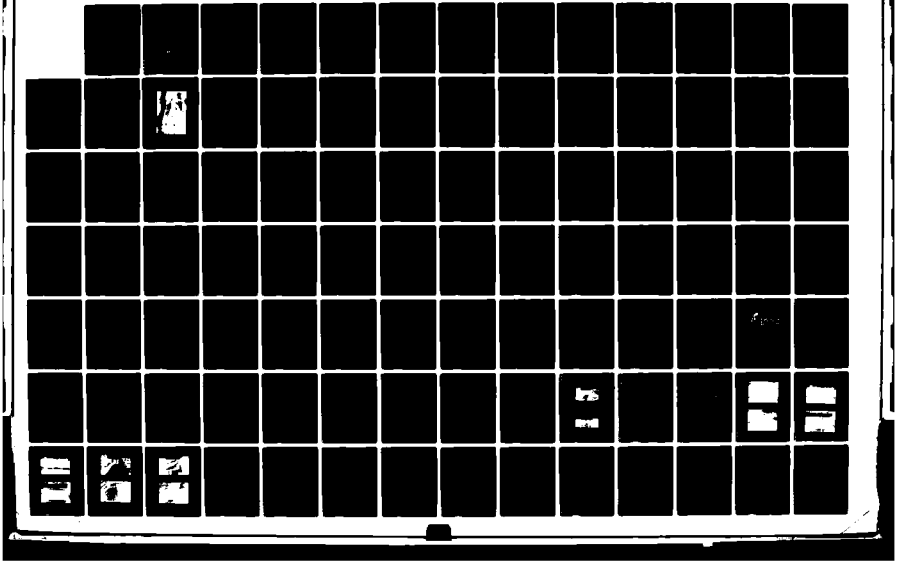

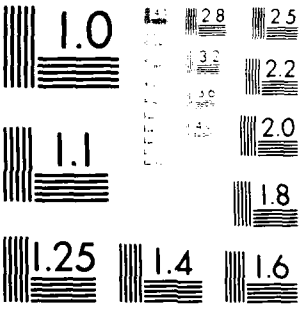

MASSACHUSETTS COASTAL BASIN

WAREHAM, MASSACHUSETTS

PARKER MILLS POND DAM

MA 00150

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JULY 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Parker Mills Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Mass. Coastal Basin
Wareham, Mass.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Parker Mills Pond Dam, is an earthen embankment with vertical, cut-stone masonry walls upstream and downstream, 3/4 of the crest is a bituminous concrete roadway. The embankment has a minimum top width of approximately 10 feet and a maximum height of 19 feet. The overall length of the dam is approximately 400 feet including two spillways. The dam is considered to be in fair condition. A test flood equal to ½ the PMF was selected.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

AUG 1 1981

NEDED

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Parker Mills Pond Dam (MA-00150) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Parker Mills Pond Dam would likely be exceeded by floods greater than 25 percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam classified as high hazard with a spillway capacity insufficient to discharge fifty percent of the PMF be judged as having a seriously inadequate spillway. As a result this dam is assessed as unsafe, non-emergency until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as it would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

We recommend that within twelve months from the date of this report the owner of the dam engage the services of a qualified registered engineer to determine further the potential of overtopping the dam and the need for and the means to increase project discharge capacity. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed and round-the-clock surveillance should be provided during periods of heavy precipitation or high project discharge.

AUG 2 1 1981

NEDED
Honorable Edward J. King

I approve the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the program.

Copies of this report have been forwarded to the Department of Environmental Quality Engineering and to the owners, the Town of Wareham and A.D. Makepeace Co. Copies will be available to the public in thirty days.

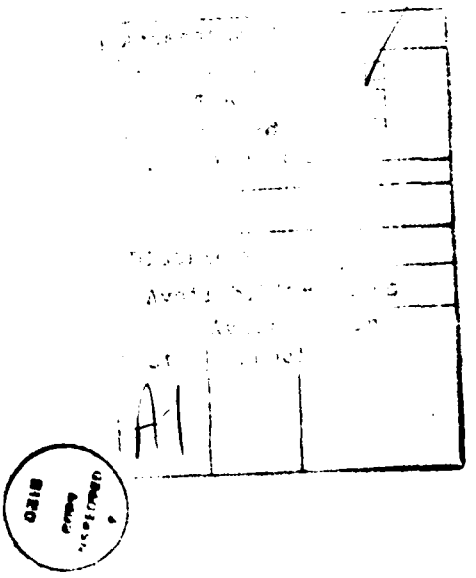
I wish to thank you and the Department of Environmental Quality Engineering for your cooperation in this program.

Sincerely,

William E. Hodgson

Incl
as stated

WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Commander and Acting Division Engineer



PARKER MILLS POND DAM

MA 00150

MASSACHUSETTS COASTAL BASIN

WAREHAM, MASSACHUSETTS

PHASE 1 INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 INSPECTION REPORT

IDENTIFICATION NO.:		MA 00150
NAME OF DAM	:	PARKER MILLS POND DAM
TOWN	:	WAREHAM
COUNTY AND STATE	:	PLYMOUTH, MASSACHUSETTS
STREAM	:	WANKINCO RIVER
DATE OF INSPECTION:		DECEMBER 9, 1980

BRIEF ASSESSMENT

The Parker Mills Pond Dam is an earthen embankment with vertical, cut-stone masonry walls upstream and downstream, 3/4 of the crest is a bituminous concrete roadway (Elm Street). The embankment has a minimum top width of approximately 10 feet and a maximum height of 19 feet. The overall length of the dam is approximately 400 feet including two spillways: the right (main) spillway located near the center of the dam, and the left spillway and fish ladder located approximately 30 ft. to the left of the main spillway. The right spillway is a concrete stoplog structure 9.6 ft. wide which discharges into a stone masonry channel. The left spillway is a concrete stoplog structure 10.8 ft. wide which discharges into a concrete discharge channel and a concrete

fishladder. There are two outlets to a mill located on the downstream face of the dam: at the right end of the dam there is an intake consisting of 2 - 3 ft. diameter concrete pipes in a concrete headwall that is apparently plugged; at an undetermined location a 2 inch line provides cooling water to the mill.

State Route 28 crosses Parker Mills Pond about 130 ft. upstream of the dam. The roadway consists of an earth embankment and a bridge about 30 ft. wide by 11 ft. high which allows flow to the spillways.

The dam impounds Parker Mills Pond, which is used for irrigation purposes and to provide cooling water to the Tremont Nail Company. Water from this pond is used in the irrigation of cranberry bogs.

Based on visual inspection and a review of all available pertinent data, the dam is considered to be in fair condition. Features that could effect the structural integrity of the dam include trees and brush growing on the crest and at the masonry walls, erosion along the crest and dam faces, loose cracked mortar and some stone displacement in the masonry walls and deteriorated concrete in the roof of the right spillway structure.

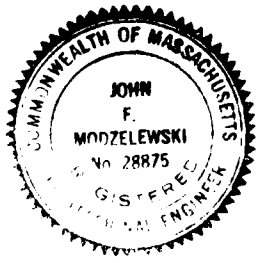
Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as "Small" in size (maximum storage about 950 acre-feet), with a "High" hazard potential. A Test Flood which approximated one-half of the Probable Maximum Flood (1/2 PMF) was selected in accordance with the Corps of Engineers' Guidelines. The calculated test flood

inflow of about 1500 cfs yields a routed outflow from the pond of about 1300 cfs. The test flood would overtop the lower portion this dam by about 1.2 ft. About 50% of the Test Flood would be carried by the dam's spillways.

Recommendations include that the owner engage the services of a qualified registered engineer to: 1) Specify and oversee the removal of trees and root systems on the crest and abutments, between and behind the blocks of the upstream face walls, and in between the blocks of the downstream channel walls. 2) Specify and oversee the resetting of all loose and displaced blocks in the masonry walls, the repairing of erosion and sloughing at the dam, the repair of the concrete roof of the right spillway. 3) Perform a detailed hydraulic and hydrologic investigation to assess further the need for and means to increase the project discharge capacity and the ability of the dam to withstand overtopping.

Technical inspections by a qualified, registered engineer should be performed every year. Downstream outlet channels should be kept clear of debris.

The owner should implement the recommendations and remedial measures as described herein and in greater detail in Section 7 of this Report within 1 year after receipt of this Phase 1 Inspection Report.



ASEC CORPORATION

John F. Modzelewski P.E.

Project Engineer/

Director of Engineering Services

This Phase I Inspection Report ... Parker Mills Pond Dam (MA-06156) has been reviewed by the undersigned [illegible] and [illegible]. In our opinion, the reported findings, conclusions, and recommendations are consistent with the recommended guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MARTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase 1 Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase 1 investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect

to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase 1 inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase 1 Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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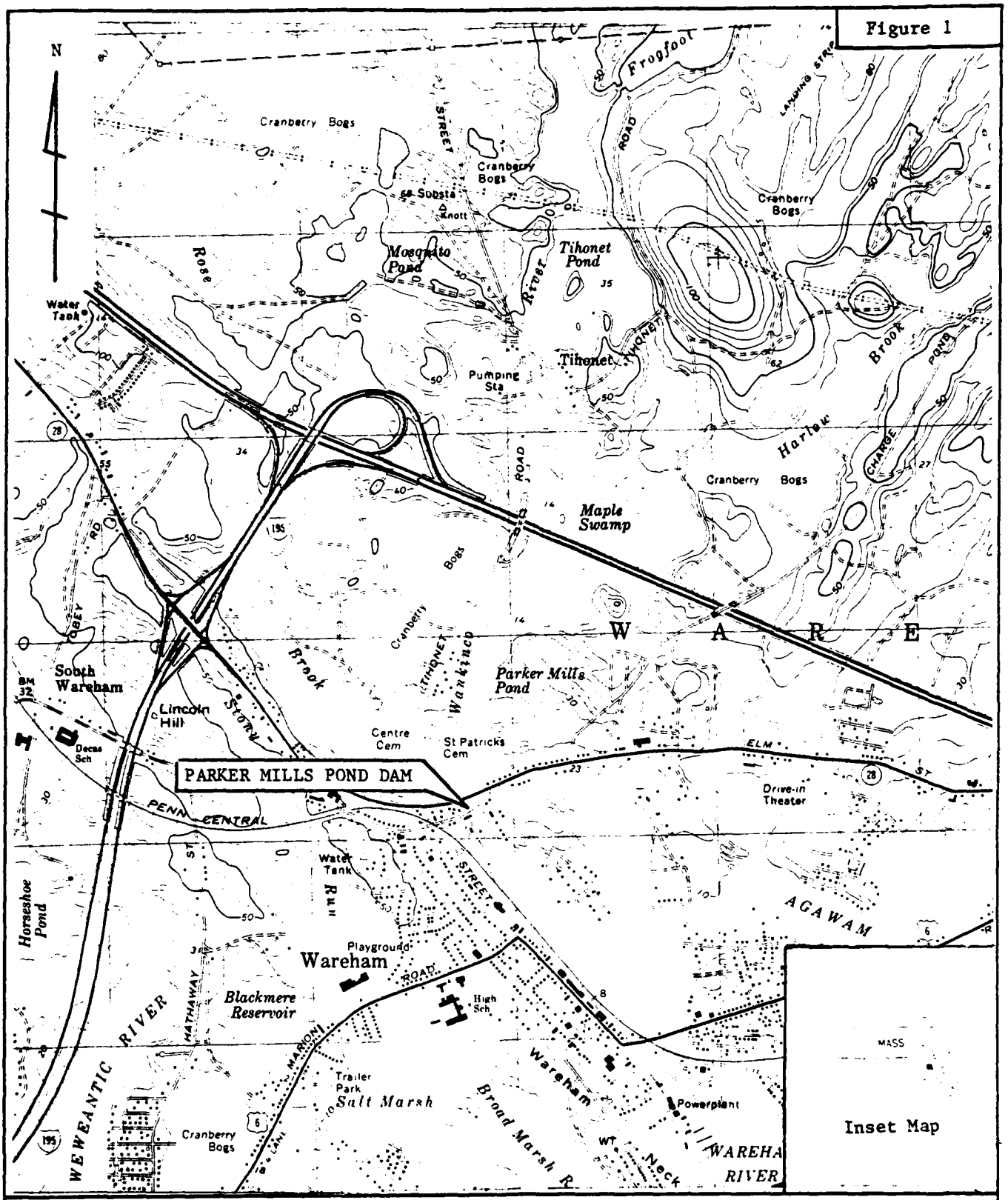
APPENDIXES

OVERVIEW PHOTO

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM , MASSACHUSETTS ASEC CORP. CONSULTING ENGINEERS BOSTON , MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	PARKER MILLS POND DAM TR. TO WANKINCO RIVER WAREHAM, MASS. MA 00150 DECEMBER 10, 1980

Figure 1



LOCATION PLAN

PARKER MILLS POND DAM
WAREHAM, MASSACHUSETTS

SCALE: 1 : 25 000

ASEC CORPORATION

WAREHAM QUADRANGLE 1972

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 INSPECTION REPORT

PROJECT INFORMATION

SECTION 1

1.1 GENERAL

a. AUTHORITY

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. ASEC Corporation has been retained by the New England Division to inspect and report on selected dams in the state of Massachusetts. Authorization and notice to proceed were issued to ASEC Corporation under a letter of December 8, 1980, from William E. Hodgson, Colonel, Corps of Engineers. Contract No. DACW33-81-C-0023 has been assigned by the Corps of Engineers for this work.

b. PURPOSE OF INSPECTION

The purposes of the program are to:

I. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

II. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.

III. To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. LOCATION

The dam is located on Elm Street in Wareham, Massachusetts. and is shown on the Wareham Quadrangle Map having coordinates latitude 41°-46.1' and longitude 70°-43.6' (See Figure 1). Located on the Wankinco River about 1/2 mile north of its confluence with the Agawam River, the dam impounds Parker Mills Pond.

b. DESCRIPTION OF DAM AND APPURTENANT STRUCTURES

The dam is an earthen embankment with vertical, cut-stone masonry walls upstream and downstream, and a bituminous concrete roadway on its crest (Elm Street) for about 3/4 of its length. The embankment has a minimum top width of approximately 10 feet and a maximum height of 19 feet. Overall length of the dam is approximately 400 feet including two spillways: the right (main) spillway located near the center of the dam, and the left spillway and fish ladder located approximately 30 ft. to the left of the main spillway. The right spillway, a concrete structure with stoplogs consists of two 4.8 ft. wide openings separated by a central pier and discharges into a stone masonry channel about

10.5 ft. wide. The left spillway is a concrete structure with stoplogs which consists of two 4.8 ft. wide openings discharging into a concrete discharge channel about 12 ft. wide and one 1.2 ft. wide opening discharging into a concrete fishladder about 3 ft. wide. All of the channels discharge into a tidal estuary at the toe of the dam. A concrete intake with 2 - 3 ft. diameter culverts serving the mill on the downstream crest is located near the right end of the dam and is apparently unused. Old records indicate this intake to empty into a 6 ft. x 6 ft. box flume. There is a 2 inch diameter pipe through the dam that provides cooling water for the mill however its exact location was unable to be determined. Route 28 crosses Parker Mills Pond about 130 ft. upstream of the dam. A concrete bridge with an opening about 11 ft. high by 30 ft. wide allows flow under this roadway. A sketch plan of the dam is included on page B-1 of Appendix B.

c. SIZE CLASSIFICATION - "Small"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Small" in size if the height is between 25 and 40 feet, or the dam impounds between 50 and 1000 acre-feet. The dam has a maximum height of 19 feet and a maximum storage capacity of about 950 acre-feet. Therefore the dam is classified as small in size based on storage capacity.

d. HAZARD CLASSIFICATION - "High"

Based on the Corps of Engineers' Recommended Guidelines for the Safety Inspection of Dams, the Hazard Classification for the dam is "High". The dam is classified as a "High" Hazard Potential structure because failure may result in the loss of more than a few lives and appreciable economic loss. Failure may damage about 4 buildings including the mill buildings and warehouses adjacent to the dam. Post-failure flooding will range up to 9 ft. compared to little pre-failure flooding. See Appendix D for failure analysis.

e. OWNERSHIP

Former Owner	:	Tremont Nail Company
Present Owner	:	
Dam	:	Town of Wareham c/o Board of Selectman Town Hall Wareham, MA
Flume & Water Control:		A.D. Makepeace Company Box 151 - 266 Main Street Wareham, MA 02571 (617) 295-1000

f. OPERATOR

Mr. Christopher Makepeace, Ass't V.P.
A.D. Makepeace Company
Box 151 - 266 Main Street
Wareham, MA 02571
(617) 295-1000

g. PURPOSE OF DAM

The dam impounds Parker Mills Pond which is a storage reservoir used for irrigating cranberry bogs and supplying cooling water to the Tremont Nail Company.

h. DESIGN AND CONSTRUCTION HISTORY

Design plans for the original dam are not known to exist. The original construction date of the dam is unknown. The dam was probably built in the eighteenth century and certainly no later than the early nineteenth century for the purpose of providing water power to the "Tihonet Lower Works", a nail factory, owned formerly by the Wareham Iron Co. The company's "Upper Works" was an iron rolling mill located on Tihonet Pond. The iron industry left the northeast and since that time the A.D. Makepeace Co. acquired first the control of and finally ownership of the flume and water control. A fishway was added to the left spillway of the dam in 1952 and in 1975 the fishway was rebuilt and a new discharge channel added.

i. NORMAL OPERATIONAL PROCEDURES

The stoplogs of both spillways are adjusted manually by A.D. Makepeace's personnel to control the level of water in Parker Mills Pond, to protect the existing nail factory on the downstream face of the dam from flooding and to prevent water from flowing over the top of Elm Street.

1.3 PERTINENT DATA

a. DRAINAGE AREA

The drainage area above the dam of about 15.2 sq. mi. is characterized by irregular topography, many cranberry bogs, small ponds, depressions, and several small streams. Elevations in the watershed area range from about El. 15 to El. 120 ft. NGVD. Tihonet Pond is located aproximately 1 1/2 miles upstream on the Wankinco River.

b. DISCHARGE AT DAMSITE

The discharge at the damsite is controlled by 2 flashboard spillways located near the center of the dam. The left spillway discharges to both a fish ladder and a discharge channel. The fish ladder opening is 1.2 ft. wide. The left spillway consists of two 4.8 ft. wide openings and a 1.2 ft. wide opening separated by concrete piers. The right spillway consists of two 4.8 ft. wide openings separated by a central pier. A third outlet for the mill consists of a concrete intake structure near the right end of the dam, discharging through the mill. The discharge from the mill outlet is negligible and the outlet is apparently plugged.

NGVD = National Geodetic Vertical Datum

1.	Outlet Works (conduit) Size:	2 - 3 ft. diameter pipes flowing into a 6' x 6' rectangular stone conduit - apparently plugged
2.	Maximum Known Flood at Damsite:	Unknown
3.	Ungated Spillway Capacity	
3a.	Right outlet: (without Stoplogs) at Top of Dam	1000 cfs
	Elevation:	17.5 ft. NGVD
	Right outlet: (with Stoplogs)* at Top of Dam	250 cfs
	Elevation:	17.5 ft. NGVD
3b.	Left outlet: (without Stoplogs) at Top of Dam:	400 cfs
	Elevation:	17.5 ft. NGVD
	Left outlet: (with Stoplogs)* at Top of Dam:	250 cfs
	Elevation:	17.5 ft. NGVD
4.	Ungated Spillway Capacity	
4a.	Right outlet: (without Stoplogs) at Test Flood Elevation	1150 cfs
	Elevation:	18.7 ft. NGVD
	Right outlet: (with Stoplogs)* at Test Flood Elevation	350 cfs
	Elevation:	18.7 ft. NGVD
4b.	Left outlet: (without Stoplogs) at Test Flood Elevation:	550 cfs
	Elevation:	18.7 ft. NGVD
	Left outlet: (with Stoplogs)* at Top of Dam:	350 cfs
	Elevation:	18.7 ft. NGVD
5.	Gated Spillway Capacity at Normal Pool Elevation Elevation:	Not applicable
6.	Gated Spillway Capacity at Test Flood Elevation Elevation:	Not applicable

* with Stoplogs in place at about El. 13.5 ft. $\pm$

7.	Total Spillway Capacity* at Test Flood Elevation Elevation:	700 cfs 18.7 ft. NGVD
8.	Total Project Discharge* at top of Dam: Elevation:	500 cfs 17.5 ft.
9.	Total Project Discharge* at Test Flood Elevation: Elevation:	1400 cfs 18.7 ft.

c. ELEVATION - Feet above National Geodetic Vertical Datum

1.	Streambed at toe of dam	0.0
2.	Bottom of Cutoff	Unknown
3.	Maximum Tailwater	N/A
4.	Normal Pool	14.2 Level on 12/9/80
5.	Full Flood Control Pool	N/A
6.	Spillway crest-(w/o Stoplogs)	12.1 left, 7.2 right
7.	Design Surcharge-Original Design	Unknown
8.	Top of Dam	Varies 17.5 to 19 ft.
9.	Test Flood Surcharge	18.7

d. RESERVOIR - Length in feet

1.	Normal Pool	6700
2.	Flood Control Pool	N/A
3.	Spillway crest pool - left	6600 ± @ El. 12.1
	Spillway crest pool - right	Unknown @ El. 7.2
4.	Top of Dam	7500
5.	Test Flood Pool	7700

* with Stoplogs in place at about El. 13.5 ft. NGVD ±

e.	STORAGE - Acre-feet	
1.	Normal pool	450
2.	Flood control pool	N/A
3.	Spillway crest pool - left	350 ± @ El. 12.1
	Spillway crest pool - right	Unknown @ El. 7.2
4.	Top of Dam	950
5.	Test Flood Pool	1200
f.	RESERVOIR SURFACE - (Acres)	
1.	Normal Pool	80
2.	Flood Control Pool	N/A
3.	Spillway crest pool - left	70 ± @ El. 12.1
	Spillway crest pool - right	Unknown @ El. 7.2
4.	Test Flood Pool	225
5.	Top of Dam	200
g.	DAM	
1.	Type	Earth embankment with stone masonry walls
2.	Length	400 feet
3.	Height	19 feet
4.	Top Width	Varies 10 ft. minimum
5.	Side slopes	Varies; vertical at masonry walls
6.	Zoning	Unknown

7. Impervious Core	Unknown
8. Cutoff	Unknown
9. Grout curtain	Unknown
10. Other	N/A
h. DIVERSION AND REGULATING TUNNEL	N/A
i. SPILLWAYS	
RIGHT SPILLWAY	
1. Type	Stoplogs in Concrete slots
2. Length of Weir	9.6 ft-2 bays @ 4.8 ft.
3. Crest	El. 7.2 ft. NGVD
4. Gates	Stoplogs
5. Upstream channel	Not observed
6. Downstream channel	Stone Masonry
7. General	Flows into tidal basin Stoplogs vary between El. 7.2 & 19.0 NGVD
LEFT SPILLWAY	
1. Type	Stoplogs in Concrete slots
2. Length of Weir	10.8 ft. - 2 bays @ 4.8 ft. & 1 bay @ 1.2 ft.
3. Crest	12.1 ft. NGVD

4.	Gates	Stoplogs
5.	Upstream channel	Not observed
6.	Downstream channel	Concrete discharge channel & fishladder
7.	General	Flows into tidal basin Stoplogs vary between El. 12.1 & 19.0 NGVD
j.	REGULATING OUTLETS - Mill Outlet	
1.	Invert	0.0 ± NGVD Downstream
2.	Size	2 - 3 ft. diameter conrete pipes at intake Flume reported to be 6 ft. x 6 ft.
3.	Description	Concrete intake Stone masonry rectangular conduit at outlet
4.	Control mechanism	Unknown
5.	Other	Negligible flow observed through this conduit

ENGINEERING DATA

SECTION 2

2.1 DESIGN DATA

Design data consisted of Plymouth County and Massachusetts Dept. of Public Works inspection reports. These reports included "As-built" sketches of the dam. No other design data is known to exist.

2.2 CONSTRUCTION DATA

No construction data was available. The fishway was rebuilt in 1975 by the Massachusetts Dept. of Marine Fisheries. Although no plan information was available a discussion was held with personnel familiar with the project as to the construction of the fish ladder.

2.3 OPERATION DATA

Records of the reservoir level are not maintained. The reservoir level is raised or lowered by the owner's foreman in response to the operational demands of the cranberry bogs and to prevent flooding of the nail factory on the downstream face of the dam.

2.4 EVALUATION OF DATA

a. AVAILABILITY

Existing data was provided by the Plymouth County Engineers and the Massachusetts Department of Environmental Quality Engineering. A list of available reference material and their location is given in Appendix B.

b. ADEQUACY

The lack of depth of engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history, hydraulic and hydrologic calculations and sound engineering judgment.

c. VALIDITY

No design plans were reviewed. Inspection sketches were out of date.

VISUAL INSPECTION

SECTION 3

3.1 FINDINGS

a. GENERAL

The visual inspection of the dam was conducted on December 9,1980. At the time of inspection, the water level of the dam was approximately 5 ft. below the crest of the dam at the roadway (El. 14.2± ft. NGVD).

b. DAM

The dam is an earthen embankment with vertical, cut-stone masonry walls upstream and downstream, and a crest that is paved over with asphalt and concrete for about 3/4 of its length. Almost the entire width of the crest is covered with an asphalt roadway and concrete sidewalk along about 3/4 of its length. The only exposed area along this section of the crest is a narrow strip of earth forming the shoulder/walkway between the roadway (Elm Street) and the Tremont Nail Works. The left side of the crest is covered with closely trimmed grass, several trees and shrubs, and two park benches and is gently curved with minor depressions. Gullying and sloughing have removed material from one area causing a depression 15 ft. by 10 ft. by 1 ft. deep and leaving a generally bare, partially grassed arcuate area reaching from the center of the crest to the upstream wall (Photo #1). The top section of the upstream wall is missing in this area, which probably contributed to the erosion and sloughing.

The upstream face consists of a near vertical, cut-stone masonry wall ranging in height from about 4 ft. to 8 ft. Along the roadway portion of the dam the mortar is cracked in places, and grasses, shrubs and brush are growing out of the base of the wall. Some wall stones have fallen into the reservoir, others have been displaced upstream by as much as 12 inches.

Along the left portion of the dam (Photos #1 & #2), several clusters of trees are growing out of the left training wall while others are growing just behind the wall. Many blocks are being displaced toward the pond by these trees (Photo #2).

The downstream face along the paved portion of the dam is a vertical stone masonry wall which also is the northern foundation wall for the Tremont Nail Works. The downstream face along the left embankment is about 5 ft. high and undulates gently with a maximum slope of about 1H:1V. The grassy slopes show evidence of only minor erosion and contain several trees and shrubs.

Between the two outlet structures (discussed below) is a strip of moderately sloping earth 38 ft. wide and about 100 ft. long. This slope is grassed and well maintained, but has occasional weeds and shrub clusters adjacent to the left wall of the right outlet. Erosion and sloughing have occurred above and adjacent to the left wall of the right outlet. A moderate erosion ditch, 1 to 3.5 ft. wide and 1 to 1.5 ft. deep, has formed adjacent to the mill structure between the mill and the right

outlet due to splash and runoff of water falling from the roof of the mill (no gutters or drainpipe were observed).

The left abutment consists of the fill blanket beneath Route 28 which is grassed over and evidences minor erosion. The right abutment consists of a paved over parking area with adjacent buildings and therefore earth materials could not be observed.

c. APPURTENANT STRUCTURES

Three outlet structures have been constructed at the site. They include the left and right spillways and the mill outlet structure (Photo # 3 & 4).

The left spillway structure includes a stone and mortar upstream face and training wall, a concrete gate structure, stoplogs, a fish ladder, and a stilling basin. The stone mortar walls are generally intact, although some mortar is cracked or missing and grass is growing between several blocks. The concrete discharge channel and fishladder are in good condition. Maximum stoplog height is 6.9 ft., the stoplogs are in good condition. There is a small reinforced concrete service bridge at the flashboard slots which is in good condition.

The right spillway structure (referred to as the "Main Spillway" in inspection reports) is also a concrete structure with a stone and mortar upstream face wall and a weathered concrete roof. The culvert under the roadway could not be observed. The concrete at the structure's roof was in generally poor condition with much spalling and exposed reinforcing evident (Photo # 5 &

6). The concrete for the observable portions of the walls and floor of the structure appeared in fair condition with no visible reinforcing or major spalling evident. Maximum stoplog height is 11.8 ft. , the stoplogs were in good condition.

The mill outlet structure runs underneath the mill and could not be observed. The concrete headwall of this structure's intake was in fair condition. Little flow was evident from this structure, it appears to be plugged.

d. RESERVOIR AREA

The banks of the reservoir in the vicinity of the dam appeared to be in stable condition. No evidence of appreciable sedimentation was observed in the reservoir.

e. DOWNSTREAM CHANNEL

The left spillway discharge channel is generally clear of obstructions with some rocks, cans and litter scattered across the channel. The concrete channel floor and walls are intact, the concrete is in good condition (Photo # 7). The stone wall adjacent to the left side of the channel is also generally intact although several blocks have fallen out of one small section of the wall.

The walls of the right spillway discharge channel are made of stone masonry which is generally mortared but mortar is absent in some places. The walls are generally intact. Shrubs, vines and grasses grow out of spaces between blocks in the left wall. The floor of the channel is concrete for about 30 ft. downstream of the flashboard structure. This portion was difficult to observe

due to the flow from the outlet, however observed portions of concrete were in fair condition. The floor has scattered cobbles, boulders, logs, and debris (Photo # 8).

The base of the mill otlet channel is unlined soil with scattered cobbles and boulders; no obstacles block the channel. The left channel wall forms part of the mill foundation for 25 ft. Past that location the wall is loose and partially destroyed by slumping and erosion of the earth behind it. The right channel wall is of unmortared stone; several stones have fallen out and others have been displaced several inches.

3.2 EVALUATION

Based on the visual inspection, the dam is judged to be in fair condition. The inspection disclosed the following items which could influence the long term performance of the dam.

Trees, brush and shrubs are growing on the crest, in between and behind the blocks of the upstream face wall, and in between the blocks of the downstream channel wall of the right outlet structure. Dead root structures can provide seepage paths through the dam; the root structures also cause movement of the blocks.

Erosion and slumping are occurring along the crest and along the upstream and downstream face of the left side of the embankment. Erosion and slumping are also occurring above and adjacent to the left wall of the right spillway structure. A moderate erosion ditch has formed between the mill and the right spillway structure, apparently due to mill roof runoff.

Mortar between the blocks in the stone masonry wall forming the upstream face of the dam and the walls of the three downstream channels is cracked, loose or absent in many places.

Many of the blocks in the upstream face of the stone masonry walls have been displaced up to several inches, and many have fallen out completely thereby weakening the walls.

Minor debris, including cobbles and boulders, has accumulated on the floor of the three downstream outlet channels reducing the carrying capacity of these channels.

The concrete roof of the right spillway structure is deteriorating with exposed reinforcing evident. This may eventually lead to inability to control the stoplogs in this structure.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 OPERATIONAL PROCEDURES

a. GENERAL

The dam is used primarily to provide storage for a cranberry bog irrigation system. The flow discharge to the bogs is under the control of the owner's foreman who regulates the stoplogs as required to accomodate their irrigation requirements. In addition the stoplogs are regulated to prevent flooding of the nail factory located just downstream of the dam. Inspections of the dam have been performed periodically for the Plymouth County Commissioners from June, 1938 to October, 1969 and by the Mass. Dept. Of Public Works on February, 1976 and September, 1973. This data and its location is included in Appendix B.

b. DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

Their is no formal warning system in effect. The surface elevation of the reservoir is routinely monitored by the owners' foreman as part of their normal operations.

4.2 MAINTENANCE PROCEDURES

a. GENERAL

The dam is visited on a continuous basis by the owner's operating personnel who has responsibility for all dams in his assigned area. From observation it appeared that the entire facility is under frequent daily observation of the owner's foreman.

b. OPERATING FACILITIES

The stoplogs for the left and right spillways are the operational portions of this dam requiring maintenance. No formal maintenance procedures exist for these items, however their condition is noted on a regular basis. The mill intake appears presently to be plugged, no other information on this intake was available. There is a 2 inch diameter cooling water line extending to the mill across the street. The valving method in unknown.

4.3 EVALUATION

Present operational procedures should be modified to include a formal warning system. The dam is monitored during periods of heavy rainfall presently, however, a formal procedure for notifying downstream authorities in the event of an emergency should be prepared.

A technical inspection of the dam should be performed once a year by a qualified registered engineer.

Maintenance procedures on the dam should be modified to include removal of brush, repair of erosion on dam crest and slopes and cleaning debris from spillways and slopes.

The method of valving the 2 inch water line should be investigated by a registered engineer and an upstream control of this line should be provided if deemed necessary.

EVALUATION OF HYDROLOGIC/HYDRAULIC FEATURES

SECTION 5

5.1 GENERAL

Parker Mills Pond Dam is located near the mouth of the Wankinco River near the center of Wareham, Massachusetts. The drainage area above the dam is 15.2 square miles. The watershed is characterized by irregular topography, many cranberry bogs, small ponds, depressions and several small streams. The surface area of Parker Mills Pond is approximately 80 acres. Downstream of the dam the Wankinco River enters a tidal basin. Tihonet Pond is located approximately 1 1/2 miles upstream of Parker Mills Pond on the Wankinco River.

5.2 DESIGN DATA

No hydraulic/hydrologic design data was available for review.

5.3 EXPERIENCE DATA

No data was available on past flooding experience or overtopping of the dam.

5.4 TEST FLOOD ANALYSIS

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the size of the dam is small. The dam has approximately 950 acre-feet of storage. Based on dam failure analysis and the above Guidelines the dam is classified as "High" hazard potential.

Based on the Corps of Engineers' guidelines, the Test Flood should be in the range of the 1/2 Probable Maximum Flood (PMF) to PMF. The 1/2 PMF was selected because of the relatively low height of the dam. It is considered that the 500 year peak discharge as computed by USGS Regional Equations for Eastern Massachusetts will yield a reasonable estimate for a large magnitude storm approaching 1/2 PMF, therefore the discharge as computed by the USGS Regional Equations for the 500 year event was used in the test flood analysis. For further discussion please see Appendix D.

The 500 year discharge was computed to be about 1500 cfs (99 cfs/ sq. mi.) peak inflow to the pond. Assuming elevation of stoplogs to be 14.0 ft. $\pm$ NGVD, the inflow was then routed through the Parker Mills Pond using the Corps of Engineers' "Surcharge Routing Alternative" and resulted in an attenuated peak test flood outflow of 1300 cfs. This outflow gives an elevation of 18.7 ft. NGVD which is 1.2 ft. above the lower portion of the dam crest and about 0.3 ft. below the roadway. The spillways pass about 50 % of the Test Flood.

5.5 DAM FAILURE ANALYSIS

A dam failure analysis was made by two different means since there is a tidal basin below the dam. Pre-failure flow was estimated to be about 450 cfs, width of breach was assumed to be about 100 ft. and did not include the spillways. The first method involved a strict volumetric comparison between Parker Mills Pond at maximum stage (El. 17.5 NGVD) and the available storage in the tidal basin downstream which is above El. 5.0 NGVD (approximate mean high tide). For the purposes of this analysis, only the basin area above Sandwich Road was used in the storage computations.

The second dam failure analysis method used was the "Rule of Thumb Guidance" provided by the Corps of Engineers. Failure was assumed with water level at the top of the dam (El. 17.5 ft. NGVD). The Route 28 bridge and embankment was assumed to fail during a breach of the dam thereby not attenuating failure flows.

From using these two methods, it was determined that the prime impact area would be in the vicinity of the dam embankment where 2 mill buildings and several other warehouses would receive flooding. The peak dam failure flow of 13,900 cfs results in a stage of 10.3 ft. NGVD at the section at the toe of the dam. No further downstream flooding is expected.

On the basis of the assumed dam failure the dam is classified as a "High" hazard potential: failure of the dam may result in the loss of more than a few lives and excessive economic losses. Post failure flooding will range up to 9 ft. compared to little, if any, pre-failure flooding, affecting approximately 4 buildings including 3 mill buildings and warehouses adjacent to the dam. These buildings are estimated to contain over 20 people during working hours. Table 1 summarizes the effects of the assumed dam failure. The dam breach calculations are shown in Appendix D.

The table below summarizes the downstream effect of failure of Parker Mills pond dam.

Location no. (see map)	Distance D/S of Dam (ft)	Number of Structures	Level Above Stream (ft)	Flow (CFS) Stage (Ft. above Stream) Before Failure	Flow (CFS) Stage (Ft. above Stream) After Failure	Comments
1	- 109	1 mill building	1.1	467/ 3.5 (flow in channel)	13,908/ 10.3	Major damage to mill building. Significant danger of loss of life. (Location on dam embankment).
		road	0			Probable wash-out. (Location below dam embankment).
		1 house	0			Possible damage to 1 house. Some danger of loss of life (Location below dam embankment).
2	109 - 1307	2 mill buildings	5 - 8	467/	13,334/8.0	Damage to mill buildings. Danger of loss of life.

Table 1 - Summary of Downstream Flooding

EVALUATION OF STRUCTURAL STABILITY

SECTION 6

6.1 VISUAL OBSERVATIONS

The visual inspection did not disclose any immediate stability problems. However, the trees, brush and shrubs growing on the crest and in between and behind blocks of the stone masonry walls, continued deterioration of concrete at the right spillway structure and continued deterioration of existing stone masonry walls, could affect the long term performance of the dam.

6.2 DESIGN AND CONSTRUCTION DATA

The information available concerning the dam design and constructuion was not adequate to evaluate the stability of the dam. Thus, the evaluation of stability is based solely on visual inspection.

6.3 POST-CONSTRUCTION CHANGES

Inspection reports and interviews with cognizant personnel indicate that the fishladder was built in 1952 and rebuilt in 1975. The 1975 construction included a new left spillway structure and discharge channel with stilling basin.

6.4 SEISMIC STABILITY

The dam is located in Seismic Zone 2 and, in accordance with Phase 1 guidelines, does not warrant seismic analysis.

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

SECTION 7

7.1 DAM ASSESSMENT

a. CONDITION

On the basis of the visual inspection, the dam is judged to be in fair condition. The following conditions will affect the long term performance of the dam:

Trees, brush and shrubs are growing on the crest, in between and behind the blocks of the upstream face wall, and in between the blocks of the downstream channel wall of the right spillway structure. Dead root structures can provide seepage paths through the dam; the root structures also cause movement of the blocks.

Erosion and slumping are occurring along the crest and along the upstream and downstream face on the left side of the embankment. Erosion and slumping are also occurring above and adjacent to the left wall of the right spillway structure. A moderate erosion ditch has formed between the mill and the right spillway structure apparently from mill roof runoff.

Mortar between the blocks in the stone masonry wall forming the upstream face of the dam and the walls of the three downstream channels is cracked, loose or absent in many places.

Many of the blocks in the upstream face of the stone masonry walls have been displaced up to several inches, and many have fallen out completely thereby weakening the walls.

Minor debris, including cobbles and boulders, has accumulated on the floor of the three downstream outlet channels reducing the flow capacity of these channels.

The concrete roof of the right spillway structure is

deteriorating with exposed reinforcing evident. This may eventually lead to inability to control the stoplogs in this structure.

b. ADEQUACY OF INFORMATION

The lack of in-depth engineering data did not allow for a definitive review. Therefore, the condition of the dam is based on visual inspection.

c. URGENCY

The recommendations and remedial measures described below should be carried out within one year of receipt of this report by the owner.

7.2 RECOMMENDATIONS

The following recommendations should be carried out under the direction of a qualified, registered engineer.

1. All brush and trees growing on the crest and abutments, between and behind the blocks of the upstream face walls, and in between the blocks of the downstream channel walls should be removed, and all stumps and roots removed and filled with proper backfill materials.

2. Investigate the cause of missing and dislodged masonry on all stone masonry walls and specify procedures to repair all loose, displaced or missing blocks in the stone walls forming the upstream face and the downstream channel walls.

3. Perform a detailed hydraulic and hydrologic analysis to assess further the need for and means to increase the project discharge capacity and the ability of the dam to withstand overtopping.

4. All areas of erosion and sloughing along the upstream

edge of the crest and behind the downstream channel walls should be repaired and a protective grass cover reestablished as required.

5. Design and implement repairs to the roof of the right spillway structure.

6. Investigate the need for upstream control on the 2 inch water line leading to the mill building on the downstream face of the dam.

7.3 REMEDIAL MEASURES

a. OPERATION AND MAINTENANCE PROCEDURES

1. The growth of brush and small trees on the crest, abutments, upstream face and downstream channel walls should be monitored and controlled.

2. The downstream outlet channels should be kept clear of debris.

3. A technical inspection of the dam should be performed once a year by a qualified, registered engineer.

4. Appropriate corrective action, e.g. roof gutters, should be taken to prevent erosion on the downstream slope of the dam near the mill building.

5. Institute a formal downstream warning system to include monitoring of the dam during heavy rains, and procedures for notifying downstream authorities in the event of an emergency.

7.4 ALTERNATIVES

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL CHECKLIST WITH COMMENTS

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT PARKER MILLS POND DAM

DATE DECEMBER 9, 1980
TIME 1:00 P.M.
WEATHER CLEAR, COLD
W.S. EL. 14.2 U.S.
0.0 D.S.

PARTY:

1. John F. Modzelewski P.E. ASEC Corporation - Civil/Structural
2. Richard M. Baker Vollmer Associates Inc. - Hydrologist
3. Richard F. Murdock P.E. Geotechnical Engineers Inc. - Geotechnical
4. Richard W. Turnbull Geotechnical Engineers Inc. - Geotechnical

PROJECT FEATURE	INSPECTED BY
1. Dam Embankment	GEI
2. Dike Embankment	None observed
3. Outlet Works - Intake Channel Intake Structure	ASEC, GEI
4. Outlet Works - Control Tower	None observed
5. Outlet Works - Transition & Conduit	ASEC
6. Outlet Works - Outlet Structure & Outlet Channel	ASEC, GEI
7. Outlet Works - Spillway Weir, Approach & Discharge Channels	ASEC, GEI
8. Outlet Works - Service Bridge	ASEC

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	Varies 17.5 NGVD ±
Current Pool Elevation	14.2 NGVD ±
Maximum Impoundment to Date	Unknown
Surface Cracks	Minor cracks in pavement.
Pavement Condition	
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Minor displacement of blocks forming upstream face along roadway; upstream displacements range 0-12"; commonly ~4".
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Erosion and sloughing along left wall of right outlet, left wall of fish ladder, along mill building right side of right outlet.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	Two park benches on left embankment indicate pedestrian traffic common.
Sloughing or Erosion of Slopes or Abutments	Gullying and sloughing above upstream areas where top stones of wall have fallen.
Rock Slope Protection - Riprap Failures	Upstream mortared stone masonry wall; mortar cracked in places; minor displacements common along wall; some stones have fallen out.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	None observed.
Instrumentation System	None observed.

2A

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME RFM, RWT

DISCIPLINE Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
DAM EMBANKMENT (CON'T.)	
Vegetation	Upstream slopes: scattered shrubs, brush and grasses growing out of wall in places; several tree clusters growing out of and immediately behind wall. Downstream slopes: generally grass with occasional bare (erosion) areas and occasional trees, shrubs and weeds.

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME --

DISCIPLINE -- NAME

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	None.
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
LEFT SPILLWAY OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Not observed (under water).
a. Approach Channel	Not observed (under water)
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	Rectangular conduit with stone masonry walls could not be observed. No evidence of displacement was apparent at conduit entrance. 5' ± wide wooden bridge in fair condition serves as sidewalk over the entrance. Material forming conduit roof beyond this point could not be observed. At the downstream end of conduit is a 7' ± wooden bridge in fair condition which serves as a sidewalk.
Condition of Concrete	
Stop Logs and Slots	

4A

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
RIGHT SPILLWAY OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Not observed (under water).
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	Rectangular conduit under roadway could not be observed. No evidence of displacement of walls at entrance.
Condition of Concrete	Concrete lintel at headwall spalled, no visible reinforcing.
Stop Logs and Slots	

4B

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILL POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
MILL OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Not observed (under water).
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	conduit under roadway could not be observed. No sign of displacement at concrete headwall. Concrete in fair condition.
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME --

DISCIPLINE -- NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	None
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

6

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM

DISCIPLINE Civil Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Conduits for all outlets are under water and could not be observed.
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
LEFT SPILLWAY OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good - minor shrinkage cracks
Rust or Staining	None
Spalling	None
Erosion or Cavitation	none
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	Some displacement along control joints no evidence of seepage.
Drain holes	None observed.
Channel	
Loose Rock or Trees Overhanging Channel	No trees; mortar cracked or missing in some areas of mortared stone masonry wing walls; no evidence of block displacement.
Condition of Discharge Channel	Generally clear; scattered cobbles and minor litter in concrete portion of channel; further downstream several blocks have fallen into channel.
Other	Flashboards in good condition. Slots in good condition

7A

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
RIGHT SPILLWAY OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Roof of outlet - poor, Walls - fair Floor not observed
Rust or Staining	Numerous spalled and cracked areas at roof of outlet structure. Sidewalls had no spalls.
Spalling	
Erosion or Cavitation	Erosion at sidewalls - minor
Visible Reinforcing	Reinforcing exposed at face of roof.
Any Seepage or Efflorescence	No seepage observed, minor efflorescence at walls.
Condition at Joints	None
Drain holes	None observed.
Channel	
Loose Rock or Trees Overhanging Channel	Several shrubs and trees overhanging left side of channel; sections of stone masonry sidewalls are unmortared; blocks may be loose; occasional shrubs, vines and grasses growing out of left wall may loosen blocks.
Condition of Discharge Channel	Generally clear; cobbles, boulders, logs and debris observed in lower reaches of right outlet channel.
Other	Observable portion of flashboard slots in fair condition. Flashboards in good condition.

7B

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM, RFM, RWT

DISCIPLINE Civil Engineer, Geotechnical Engineer NAME

AREA EVALUATED	CONDITION
MILL OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	N/A - Stone masonry outlet in fair condition
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	None observed.
Channel	Unlined earth and scattered cobbles.
Loose Rock or Trees Overhanging Channel	Unmortared channel walls loose, collapsed in places; earth above wall generally barren, eroded, slumped.
Condition of Discharge Channel	Generally clear; strewn with cobbles and boulders.

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME --

DISCIPLINE -- NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	None.
a. Approach Channel	SEE NOTES UNDER OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE
General Condition	& OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel	
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Channel	
Other Obstructions	
Other Comments	

PERIODIC INSPECTION CHECKLIST

PROJECT PARKER MILLS POND DAM DATE Dec. 9, 1980

PROJECT FEATURE see below NAME JFM

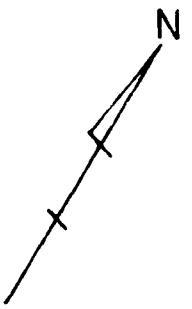
DISCIPLINE Civil Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE @ LEFT OUTLET	
a. Super Structure	
Bearings	N/A
Anchor Bolts	N/A
Bridge Seat	N/A
Longitudinal Members	N/A
Underside of Deck	N/A
Secondary Bracing	N/A
Deck	Reinforced concrete deck in good condition
Drainage System	N/A
Railings	Pipe rails in good condition
Expansion Joints	N/A
Paint	none
b. Abutment & Piers	
General Condition of Concrete	Good
Alignment of Abutment	Vertical
Approach to Bridge	N/A
Condition of Seat & Backwall	Reinforced concrete deck poured monolithic with sidewalls of discharge channel & fishladder.

APPENDIX B

ENGINEERING DATA

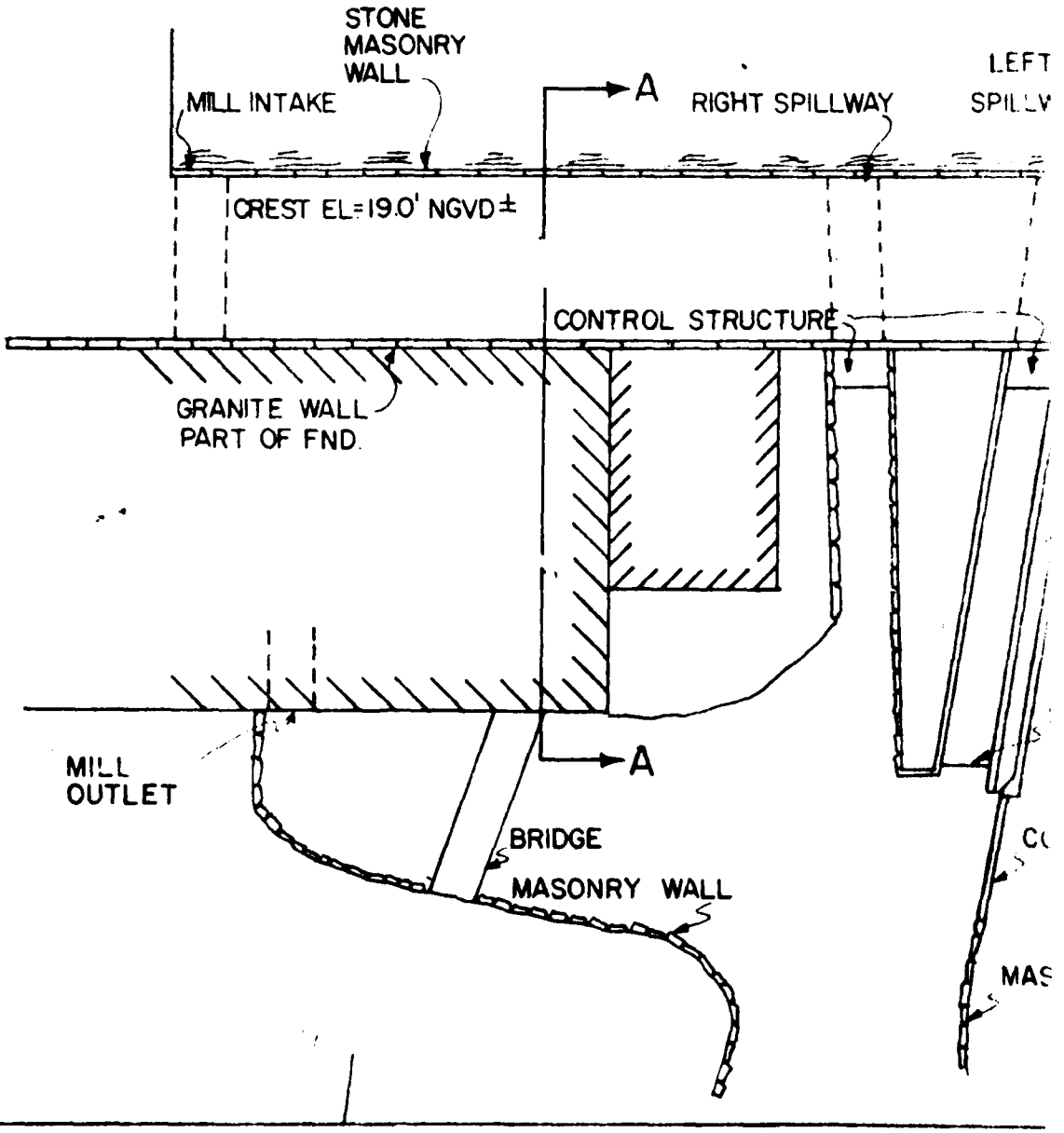
NOTE:
SKETCH PLAN ONLY.
PREPARED SOLELY FOR THE PURPOSES
OF PHASE I INSPECTION REPORT

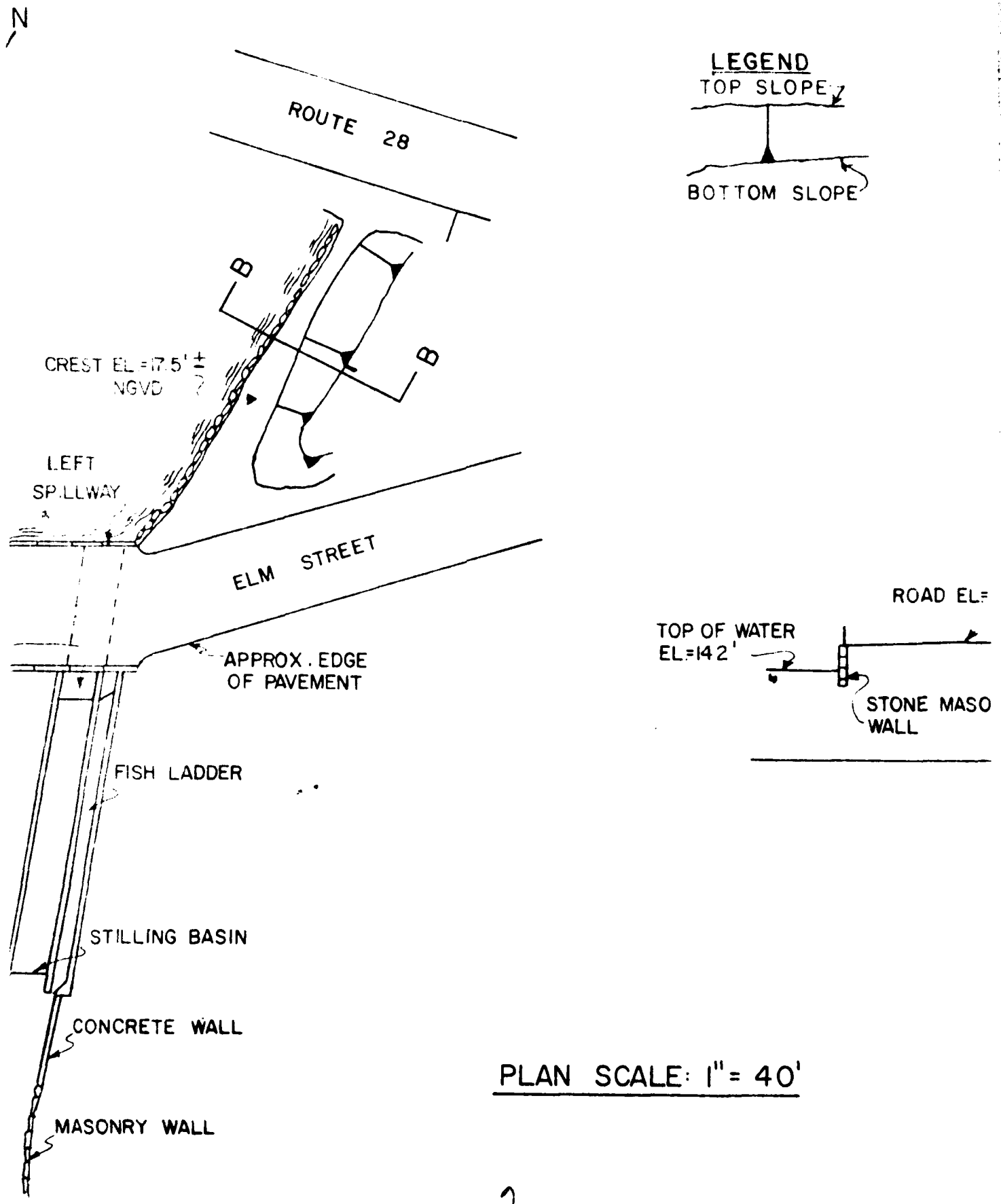


PARKER MILLS POND

WATER EL.=14.2' NGVD (12-9-80)

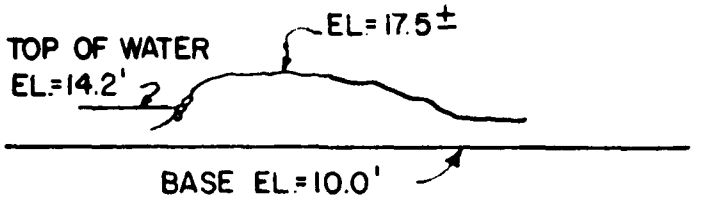
CRES



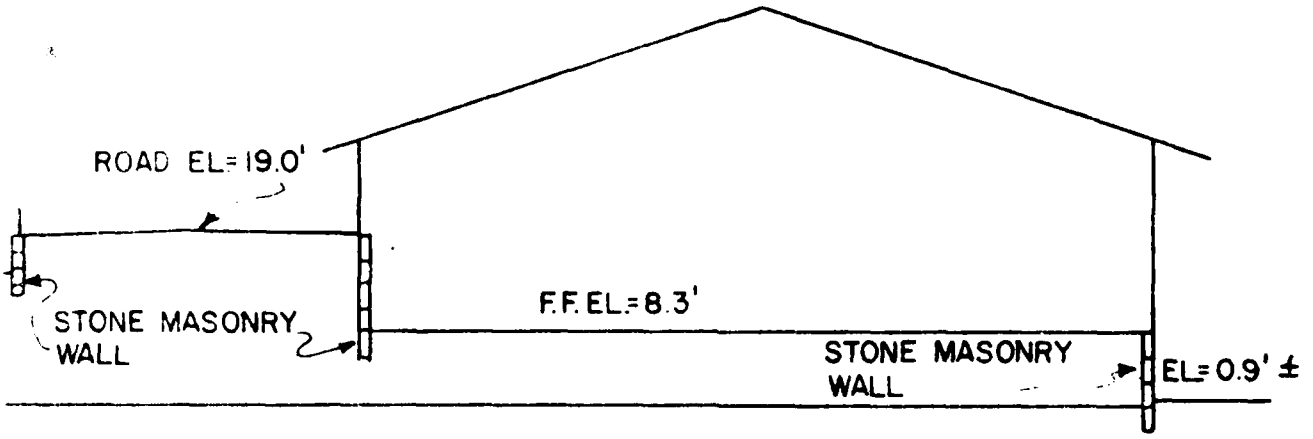


PLAN SCALE: 1" = 40'

FIG. 2



SECTION B-B
SCALE 1"=20'



SECTION A-A
SCALE 1"=20'

ASEC CORPORATION *CONSULTING ENGINEERS* BOSTON, MASS.	U S ARMY ENGINEER DIV NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PARKER MILLS POND DAM
WAREHAM, MASS.

MASS.# 00150

DRAWN	CHECKED	APPROVED	SCALE	DATE	PAGE
J.A.P.	J.F.M.	J.F.M.	AS SHOWN	MAY, 1981	B-1

LIST OF REFERENCES

REFERENCE	LOCATION
1. Inspection Report - Dams & Reservoirs Dam # 7-12-310-7 Dated 9-27-73	Mass. Dept. of Environmental Quality Engineering Division of Waterways 1 - 11 Winter Street Boston, MA 02110 Tel. (617) 727-4797
2. Inspection Report - Dams & Reservoirs Dam # 7-12-310-7 Dated 2-16-76	Mass. Dept. of Environmental Quality Engineering Division of Waterways 1 - 11 Winter Street Boston, MA 02110 Tel. (617) 727-4797
3. Inspection of Dams & Reservoirs Dam # 10 Dated July, 1936	Plymouth County Commissioners Highway Department South Russel Street Plymouth, MA 02360

DAM NO. 10

COUNTY OF PLYMOUTH, MASSACHUSETTS
ENGINEERING DEPARTMENT
INSPECTION OF DAM AND RESERVOIRS

Inspector Bamber & Gfroerer. Date July, 1936 City or Town Wareham.

Location On State Highway at Wareham Centre - Southerly end of Parker Mill Pond.

Owner Tremont Nail Works. Use Mill Power.

Material and Type Roadway forms dam. Stone facing with probably clay & gravel fill.

Maximum Head in Feet (Full Pond Level to Bottom of Spillway) 14 feet.

Length 300 feet. Width 42 feet.

Area of Watershed 18 Sq. Miles Capacity 50,000,000 Gallons

Length of Overflow or Spillway 9'-2" Outlets (Pipes or Flumes)

Box flume to Mill 6' wide by 6' high.

Dam Constructed by Date

Recent Repairs Date

Evidence of Leakage None.

Condition Good.

Topography of Country Below Low - Discharges into Wareham River - Tidewater.

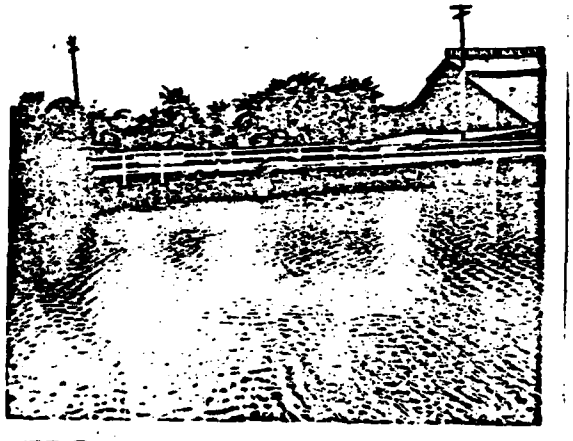
Nature, extent, proximity, etc. of buildings, roads or other property in danger if failure should occur

Damage to road and to Nail Works only in case of failure.

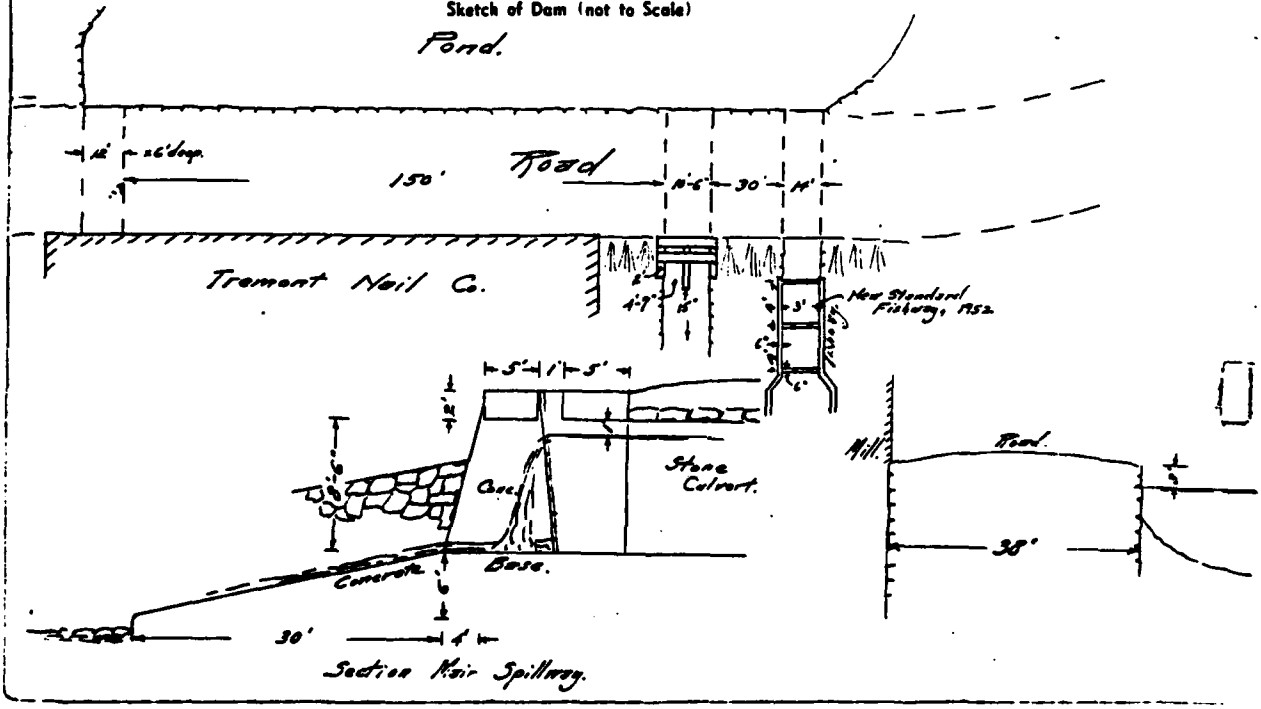
Remarks and Recommendations

Spillway ample if properly regulated under extreme rains. Unchanged June 1938 & Feb 1939. Unchanged Dec. 1941. Unchanged April 1st No changes - good Nov. 1948. No change Nov. 1949. Unchanged Sept. 1951. Sound - no changes Good Nov. Fishway Added 1952. Feb. 1953. Sound Nov. 1955. Good - no change May 1957. No changes - good Sept. 1959. Sound - good condition Sept. 1961. Good - no change Sept. 1963. Good - no change Dec. 1965. Good - no change Nov. 1967. Good - channel wall stones out, fishway walls cracked Oct. 1969.

DAM NO 10.



Sketch of Dam (not to Scale)



Section Main Spillway.

Dashnet Elec 9x6 glossy pictures follow

October 16, 1973

Tremont Nail Works
15 Elm Street
Wareham, Massachusetts

RE: Inspection - Dam #7-12-310-2
Wareham
Parker Mills Pond Dam

Gentlemen:

An engineer from the Massachusetts Department of Public Works has inspected the above dam owned by the Tremont Nail Works.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. The fishway is undermined and the sidewalls are cracked and deteriorated, with some portions lying in the emergencyspillway. Repair or reconstruct as necessary.

2. Remove all obstructions from the emergency spillway.

3. The material adjacent to the fishway sidewalls has eroded. This requires replacement with suitable material, properly compacted and graded.

We call these conditions to your attention now before they become serious and more expensive to correct.

Very truly yours,

F. C. Schwelm

FRED. C. SCHWELM, P.E.
Deputy Chief Engineer

LRA:hlb
cc:R.J.Kelleher
J. Delano

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town Wareham Dam No. 7-12-310-2

Name of Dam Parker Mills Pond Dam Inspected by: J. Delano & G. Bumpus

Date of Inspection 9-27-73

2. Owner/s: Per: Assessors ✓ Prev. Inspection 1-22-71

Reg. of Deeds _____ Pers. Contact _____

1. Tremont Nail Works 15 Elm Street, Wareham, Mass.
Name St.& No. City/Town State Tel.No.

Name St.& No. City/Town State Tel.No.

Name St.& No. City/Town State Tel.No.

3. Caretaker: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name St.& No. City/Town State Tel.No.

4. No. of Pictures taken 5

5. Degree of Hazard: (if dam should fail completely)*

1. Minor ✓ 2. Moderate _____

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual ✓

Operative ✓ yes; _____ No

Comments: Flashboards

7. Upstream Face of Dam: Condition:

Conditions:

1. Good ✓ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

Dam No. 7-12-310-2

8. Downstream Face of Dam:
Condition: 1. Good ✓ 2. Minor Repairs_____
3. Major Repairs_____ 4. Urgent Repairs_____
Comments:_____

9. Emergency Spillway:
Condition: 1. Good_____ 2. Minor Repairs ✓
3. Major Repairs_____ 4. Urgent Repairs_____
Comments: Concrete Fishway walls are breaking up. They should be rebuilt or replaced with a suitable retaining wall.

10. Water Level at Time of Inspection:
3½ ft. above_____. below ✓. top of dam_____
principal spillway ✓. other_____.

11. Summary of Deficiencies Noted:
Growth (Trees & Brush) on Embankment None
Animal Burrows & Washouts None
Damage to Slopes or Top of Dam None
Cracked or Damaged Masonry Yes, Fishway walls in Emerg. Spillway.
Evidence of Seepage None
Evidence of Piping None
Erosion Yes, on slope adjacent to undermined Fishway walls.
Leaks None
Trash and/or Debris Impeding Flow Pieces of broken Fishway concrete.
Clogged or Blocked Spillway Walls are slightly impeding flow in Energy. Spillw
Other_____

12. Remarks & Recommendations: (Fully Explain)

The dam is in good condition, but the Fishway walls in the Emergency Spillway are breaking up.

These Fishway walls should be rebuilt, or replaced with a suitable retaining wall.

The eroded slope behind the Fishway wall should be filled with suitable material, and compacted.

13. Overall Condition:

1. Safe ✓
2. Minor Repairs Needed ✓
3. Conditionally Safe - Major Repairs Needed
4. Unsafe
5. Reservoir Impoundment no Longer Exists (explain)

   Recommend Removal from Inspection List

DESCRIPTION OF DAM

DISTRICT 7

Submitted by John Delano Dam No. 7-12-310-2

Date 10-3-73 ~~City~~/Town Wareham

Name of Dam Parker Mills Pond Dam

1. Location: Topo Sheet No. 45C

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year Built Unknown Year/s of Subsequent Repairs —

3. Purpose of Dam: Water Supply ✓ Recreational

Irrigation Other

4. Drainage Area: 18 Sq.Mi. Acres

5. Normal Ponding Area: Acres Ave.Depth

Impoundment: 150,000,000 Gals. Acre Ft.

6. No. and Type of Dwellings Located Adjacent to Pond or Reservoir

i.e. Summer Homes, etc. 1 Factory, 1 Home

7. Dimensions of Dam: Length 300' Max. Height 14' Max. Head

Slopes: Upstream Face Vert.

Downstream Face Vert.

Width Across Top 38'

8. Classification of Dam by Material:

Earth ✓ Conc. Masonry Stone Mason.

Timber Rockfill Other

DAM NO. 7-12-310-2

9.

A. Description of Present Land Usage Downstream of Dam:

100 % rural _____ % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure ✓ yes _____ no

---

10.

Risk to Life and Property in Event of Complete Failure

No. of People 0

No. of Homes 0

No. of Businesses 0

No. of Industries 1 Type Nail Factory

No. of Utilities 0 Type _____

Railroads N.Y.N.H. & H.

Other Dams 0

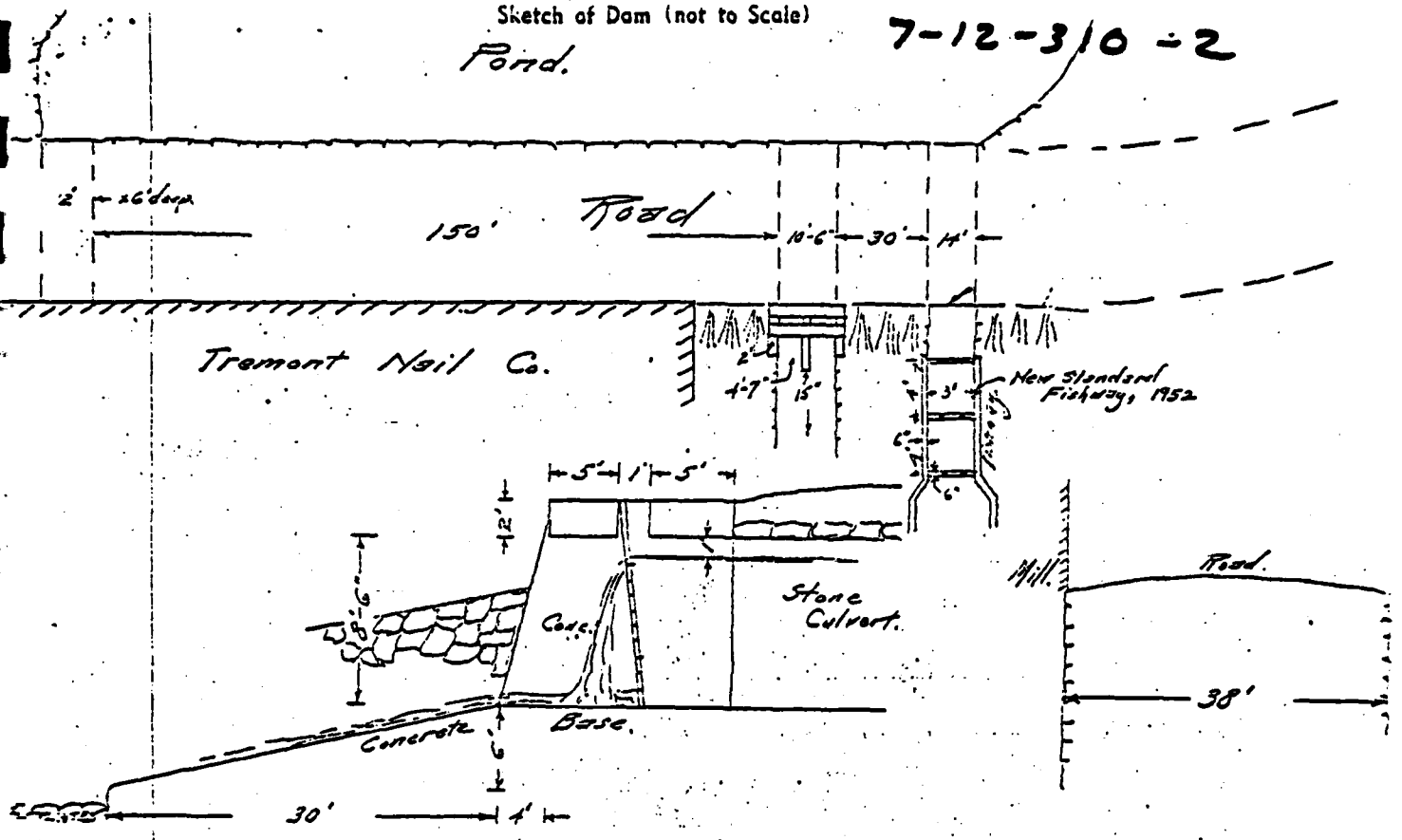
Other _____

11.

Attach sketch of dam to this form showing section and plan on an 8½" x 11" sheet.

Sketch of Dam (not to Scale)

7-12-310-2



Section Main Spillway.

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town Wareham Dam No. 7-12-310-2

Name of Dam Porter Mills Pond Inspected by: K.B. Harrison & G.G. Bumpus

Date of Inspection: 2-18-76

2. Owner/s: Per: Assessors ✓ Prev. Inspection 9-27-73

Reg. of Deeds _____ Pers. Contact _____

Dam 1. Town of Wareham Jo Board of Selectmen, Town Hall Wareham, Mass.

Name | St. & No. | City/Town | State | Tel. No.

Flume & Water Control Tremont Nail Works 15 Elm St. Wareham Mass.

Name | St. & No. | City/Town | State | Tel. No.

3. Caretaker: (if any) e.g. superintendent, plant manager appointed by absentee owner, appointed by multi-owners.

Name | St. & No. | City/Town | State | Tel. No.

4. No. of Pictures taken: Two (2)

5. Degree of Hazard: (if dam should fail completely)*

1. Minor ✓ 2. Moderate _____

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual ✓

Operative: Yes ✓ No _____

Comments: Two bay concrete flume w/ flashboards. (The flume is on the downstream face of the dam)

7. Upstream Face of Dam:

Conditions:

1. Good ✓ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: Granite block facing ✓

Dam No. 7-12-310-2

8. Downstream Face of Dam:

Conditions:

1. Good ✓ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

9. Emergency Spillway: Yes.

Conditions:

1. Good ✓ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: New combination emergency spillway & fishway built in 1975 & constructed by the State Division of Marine Fisheries

10. Water Level at Time of Inspection:

3.8 ft. _____ above ✓ below top of dam.

✓ principal spillway _____ other

11. Summary of Deficiencies Noted:

Growth (Trees & Brush) on Embankment _____

Animal Burrows & Washouts _____

Damage to Slopes or Top of Dam _____

Cracked or Damaged Masonry _____

Evidence of Seepage _____

Evidence of Piping None.

Erosion _____

Leaks _____

Trash and/or Debris Impeding Flow _____

Clogged or Blocked Spillway _____

Other _____

Dam No. 7-12-310-2

12. Remarks & Recommendations (fully explain)

Elm St itself makes up this dam & has good height and width & is in good condition.
The principal flume is old, but sound.
A new emergency flume & fishway was constructed in 1975.
Note: Both the principal & emergency spillways are on the downstream face of the dam.
The stone culverts under Elm St leading to the spillways are the responsibility of the Town & according to Mr. Fernandez the D.P.W. Supt. have been checked and found safe.

13. Overall Condition:

1. Safe ✓
2. Minor Repairs Needed
3. Conditionally Safe - Major Repairs Needed
4. Unsafe
5. Reservoir Impoundment no Longer Exists (explain)

Recommend Removal from Inspection List

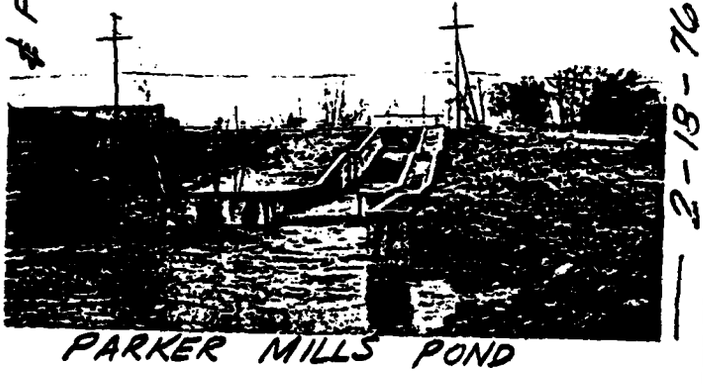
#7-12-310-2

PRINCIPAL SPILLWAY

2-18-76

PARKER MILLS POND

#7-12-310-2



NEW EMERGENCY SPILLWAY & FISHWAY 1975

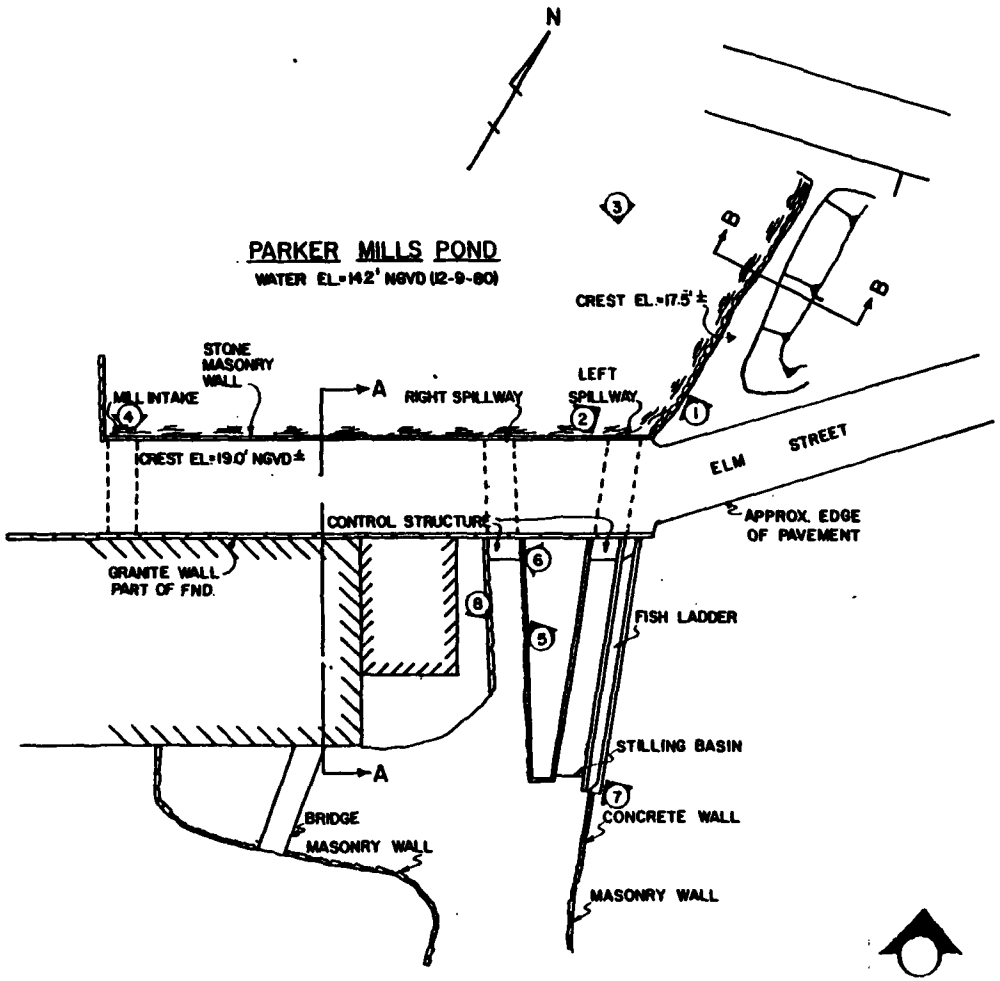
2-19-76

PARKER MILLS POND

APPENDIX C

PHOTOGRAPHS

FIGURE 3



DENOTES PHOTO NUMBER AND DIRECTION IN WHICH PHOTO WAS TAKEN

ASEC CORPORATION *CONSULTING ENGINEERS* BOSTON, MASS. FEBRUARY 1981	PHOTO LOCATION PLAN PARKER MILLS POND DAM MA 00150 WAREHAM, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS.

C-1

Photo # 1 Left crest of dam, note erosion at face

Photo # 2 Left crest of dam and upstream face

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS ASEC CORP. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	PARKER MILLS POND DAM TR. TO WANKINCO RIVER WAREHAM, MASS. MA 00150 DECEMBER 9, 1980

Photo # 3 Intakes to left and right spillway structures

Photo # 4 Intake to Mill Outlet

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	PARKER MILLS POND DAM TR. TO WANKINCO RIVER WAREHAM, MASS. MA 00150 DECEMBER 9, 1980
ASEC CORP. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS		

Photo # 3 Intakes to left and right spillway structures

Photo # 4 Intake to Mill Outlet

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS ASEC CORP. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	PARKER MILLS POND DAM TR. TO WANKINCO RIVER WAREHAM, MASS. MA 00150 DECEMBER 9, 1980

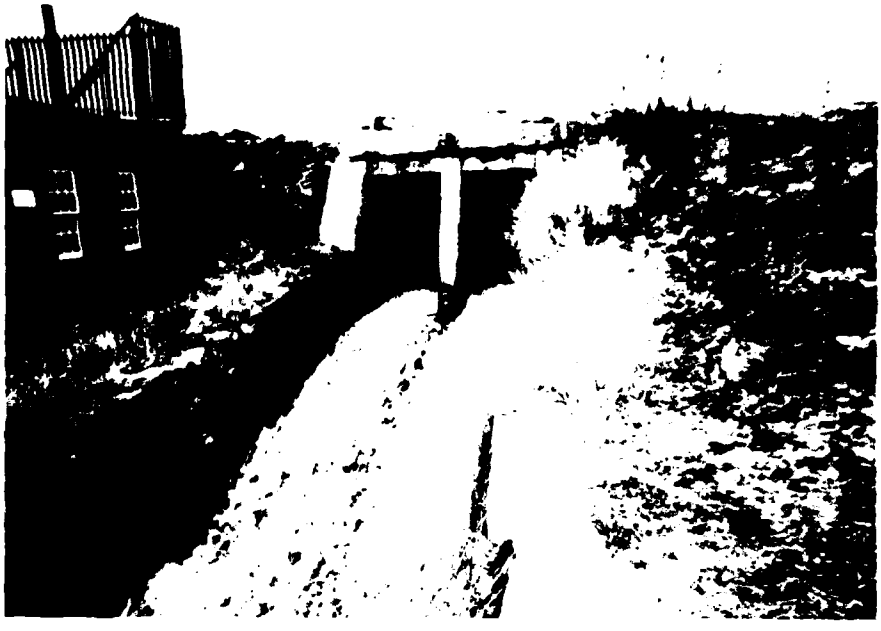


Photo # 5 Right spillway structure

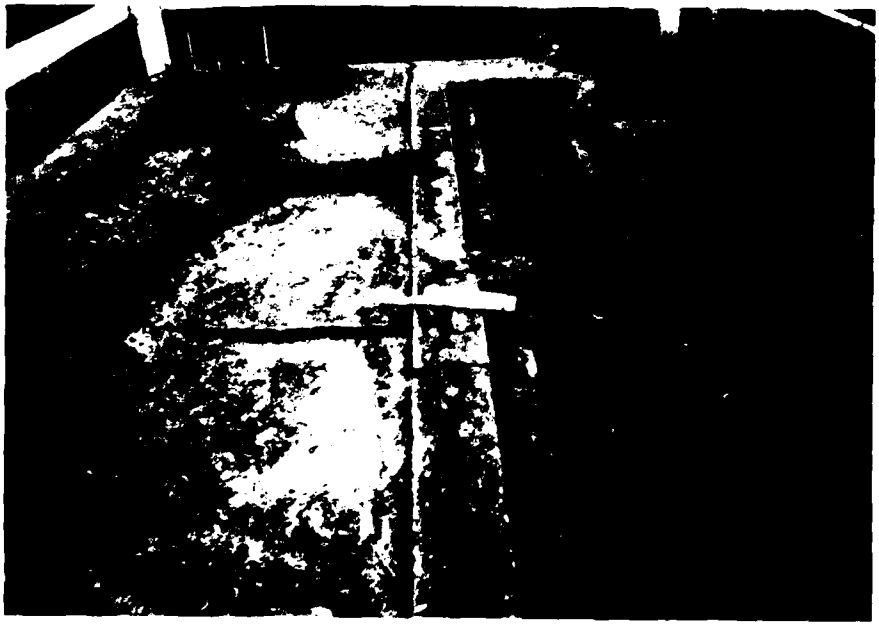


Photo # 6 Deteriorated concrete at roof of right spillway structure (rule extended 1 ft.)

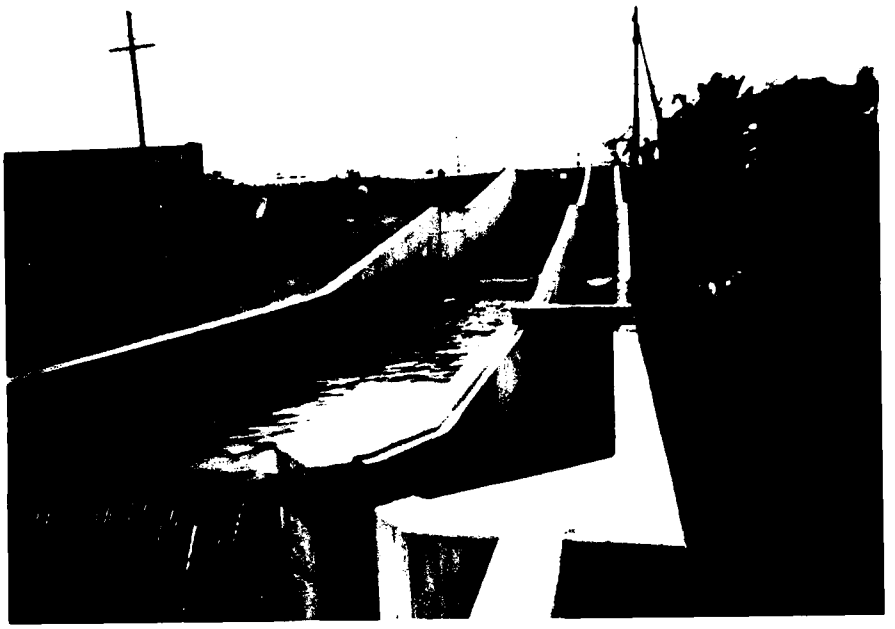


Photo # 7 Discharge channel, stilling basin, and fish ladder left spillway

Photo # 8 Discharge channel for right spillway

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	PARKER MILLS POND DAM TR. TO WANKINCO RIVER WAREHAM, MASS. MA 00150 DECEMBER 9, 1980
ASEC CORP. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS		

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

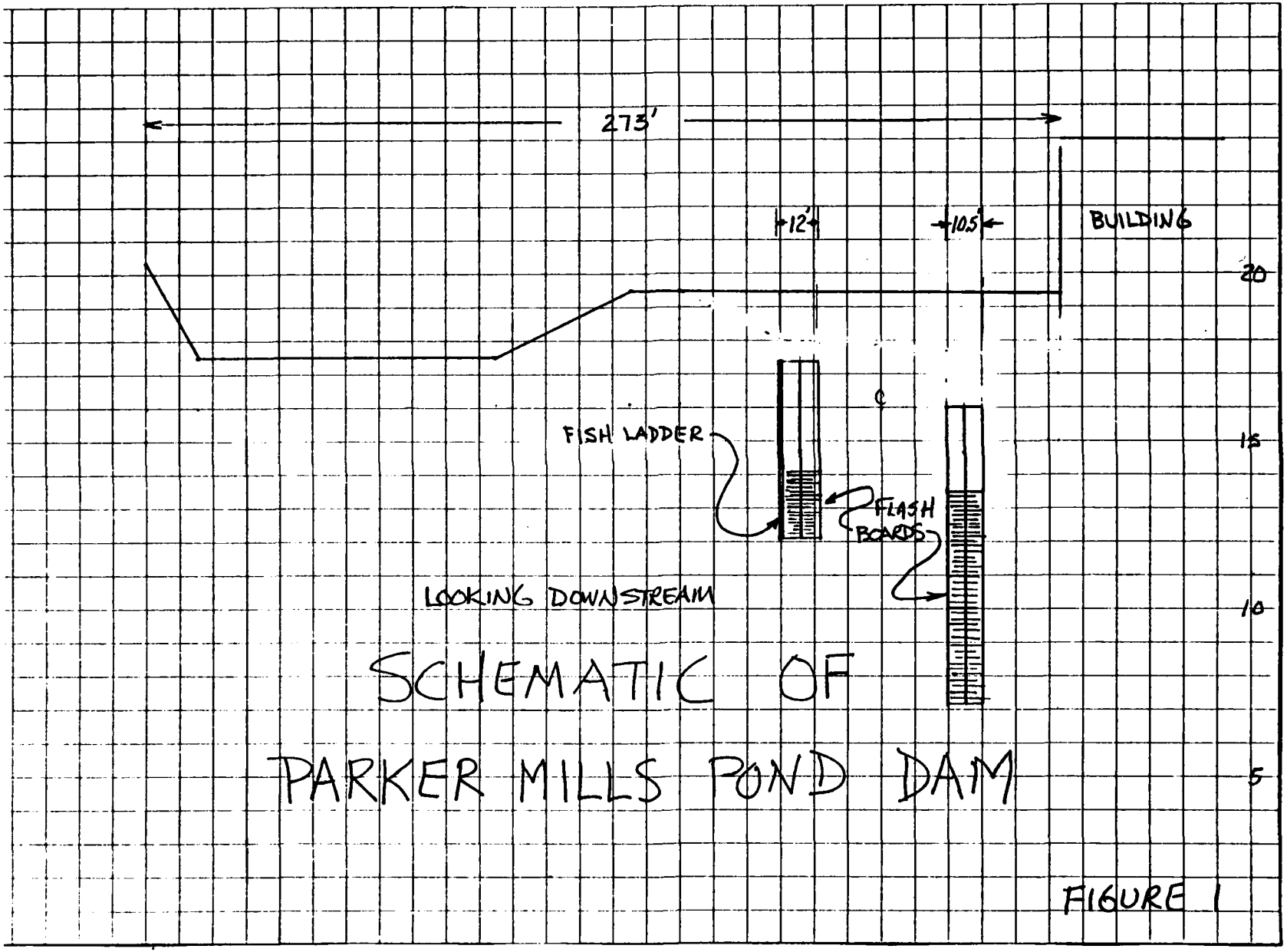
PARKER MILLS POND
WAREHAM, MASSACHUSETTS

Dam Rating Curve

A schematic sketch of the dam and outlet structures is shown in Figure 1. The sketch is based upon a recent field inspection and survey of the site. This information was used in the hydrologic and hydraulic analysis of the dam.

The outlet structures consist of two flashboard spillways and a fish ladder. The fish ladder opening is 1.2' wide by 4.9' high (to top of dam) with an invert of 12.1' MSL. The left spillway consists of two 4.8' by 3.4' high (to top of dam) openings above the flashboards with a 0.6' center pier. The invert of the flashboards is 14.1' MSL and without flashboards the invert is 12.1' MSL. The right spillway consists of two 4.75' wide by 4.0' high (to top of dam) openings above the flashboards with a 1.0' center pier. The invert of the flashboards is 13.5' MSL and without flashboards the invert is 7.2'MSL. The lowest point on the dam embankment is approximately 17.5± MSL.

The stage-discharge relationships for Parker Mills Pond were computed using a HEC-2 multiple profile analysis. A range of discharges was used in the analysis in order to construct the stage-discharge curve for Parker Mills Pond as shown on Graph 1.



SCHEMATIC OF PARKER MILLS POND DAM

FIGURE 1

DAM FAILURE ANALYSIS

Dam Failure with Maximum Pool

Assume that the dam fails with the pool at maximum level, which corresponds to the elevation of the top of the embankment (17.5'MSL). The toe of the dam embankment is approximately 109' downstream from the spillways. Flow over the spillways passes into two open channels, the right side of field stone construction open directly to the tidal basin and the left side a rectangular concrete channel with a stilling basin at the toe and fish ladder on the left side. Flow over the dam passes into the tidal basin at the toe so the invert at the toe was assumed at 0.0' MSL. The dam embankment also consists of a roadway approximately 11' upstream from the spillways. The waterway openings of the roadway consist of a 12.3' wide by 7.0' high opening on the left side with an invert of 10.0' MSL and a 10.2' wide by 8.2' high opening on the right side with invert at 6.5' MSL. The left side overbank is a levee on the upstream side of the roadway which also corresponds to the low point of the embankment at 17.5' MSL (see Figure 1).

Normal Outflow at Failure

Q = 467 CFS (rating curve at maximum pool - 17.5' MSL - Graph 1).

Breach Outflow

$$Q_{pl} = 8/27 \times Wb \times \sqrt{g} \times Y_o^{1.5}$$

where: Wb = width of breach

$\leq$ 0.4 x (width dam at ½ height)

$\leq$ 0.4 x 273

use: Wb = 109'

Y_o = pool elevation - downstream invert = 17.5'

$$Q_{pl} = 8/27 \times 109 \times \sqrt{32.2} \times 17.5^{1.5} = 13{,}441 \text{ CFS}$$

Total Outflow

Q_{total} = 467 + 13,441 = 13,908 CFS

Impounding Capacities of Pond

Pool at top of dam (maximum - 17.5' MSL)
Volume = 940 acre-feet
Pool at normal storage capacity
Volume = 460 acre-feet

The stage-surcharge storage curve for Parker Mills Pond is shown on Graph 2.

Tailwater Level at Failure

Immediately preceeding failure, a mean high tide elevation of 5.0' MSL was assumed for the tidal basin at the toe of the dam. A stage-storage curve was constructed for the tidal basin above Sandwich Road (Graph 3). A volumetric comparison of storage in Parker Mills Pond, at maximum elevation 17.5' MSL from Graph 2 equal to 940 acre-feet, was made versus storage in the tidal basin assuming zero outflow through the Sandwich Road bridge. The mean high tide elevation of 5.0' MSL results in a storage volume of 1,248 acre-feet. A resultant post failure stage under the assumed condition was estimated as follows:

1,248 + 940 = 2,188 acre-feet

From Graph 3, a storage 2,188 acre-feet results in a stage of 7.3' MSL which is 2.3' above the mean high elevation of 5.0' MSL. This failure stage would cause insignificant damage to downstream areas as it is well within the expected high tide and storm tidal surge elevations of this coastal region. From the Federal Emergency Management Agency, Flood Insurance Study, for the Town of Wareham,

Massachusetts, the storm tidal surge elevations for the entire coastline of Wareham are given as follows:

	ELEVATION (FEET)			
LOCATION	10 YEAR	50 YEAR	100 YEAR	500 YEAR
Buzzards Bay				
Wareham Coastline	9.8	13.3	14.7	17.7

The peak dam failure flow of 13,908 CFS results in a stage of 10.3' at the section at the tow of the dam (109' downstream of the spillways - Graph 4). The significant damage due to failure of Parker Mills Pond would be in the immediate vicinity of the dam embankment. There is a mill located on the dam embankment and several other commercial/industrial type buildings in the immediate vicinity which would sustain damage. It is estimated that approximately 6 to 8 buildings would sustain damage - 2 buildings would receive major damage and several others some damage due to shallow flooding. The roadway over the dam embankment would also be washed-out.

Approximatley 130' upstream of the roadway over the dam embankment, Route 28 crosses Parker Mills Pond. The waterway opening of this bridge is approximately 11.1' high by 30.0' wide or 333 square feet. Assuming critical flow through this bridge, the maximum capacity is computed as follows:

At elevation 17.5' Wetted perimeter = (9.9 x 2) + 30 = 49.8'

Area = 9.9 x 30 = 297 square feet

Hydraulic radius = $\frac{A}{WP}$ = 5.96'

$$V = \frac{1.49}{17} (R^{2/3}) (S^{1/2})$$

Estimate slope $\approx$ 0.012

$$V = \frac{1.49}{0.03} (5.96)^{2/3} (0.012)^{1/2} = 18'/sec.$$

$$Q = VA = 18 \times 297 \approx 5,300 \text{ CFS}$$

If the Route 128 bridge remained intact after a failure of Parker Mills Pond dam, the estimated failure flow peak of 13,908 CFS would probably not be realized as almost 100% of Parker Mills Pond is located upstream of Route 28. The failure flow would be controlled at approximately 5,300 CFS. This would significantly reduce damage to buildings in the vicinity of the Parker Mills Pond dam.

Estimated Failure Wave Attenuation

An analysis was made to estimate the peak failure wave height in the downstream impact area assuming the worst possible condition, the peak failure flow of 13,908 CFS uncontrolled by the Route 28 embankment. This assumes that the Route 28 bridge is also washed out after Parker Mills Pond dam fails.

Cross-sections located throughout the downstream impact area were coded and input into a HEC-2 multiple profile run using nine discharges covering the range of discharges expected during dam failure analysis. Results were used to construct stage-discharge and stage-cross-section area curves for each cross section (see Graphs 4-8).

Downstream Flooding

At 109' downstream of dam

Prior to failure

depth = 5.0' (mean high tide)

After Failure

depth = 10.3' (Graph 4, with Q = 13,908 CFS)

Reach from 109' downstream to 1,307' downstream of dam

To estimate peak dam break flow at a distance 1,307' downstream of dam, we followed (essentially) the COE "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs."

Use stage-discharge and stage-cross-section area curves for sections 109' and 1,307' downstream of dam (Graphs 4 and 5).

Storage volume in reach-versus-outflow

Assume channel and overbank storage of the flood wave is equal to the reach length times the average of the upstream post-failure flow area minus the upstream pre-failure flow area and the downstream post-failure flow area minus the downstream pre-failure flow area:

$$\text{Volume } (Ft^3) = \left[\frac{((Ap_1 - A_{N_1}) + (Ap_1 - A_{N_2}))}{2} \right] X \ L$$

where: A_{p_1} = post-failure u/s cross-sectional flow area (Ft^2)

A_{N_1} = pre-failure u/s cross-sectional flow area (Ft^2)

A_{p_2} = post-failure d/s cross-sectional flow area (Ft^2)

A_{N_2} = pre-failure d/s cross-sectional flow area (Ft^2)

L = reach length in feet

The attenuation of dam failure flow due to storage in the reach between 109' and 1,307' d/s:

$$Q_2 = 467 + Q_{p_1} \left(1 - \frac{V_1}{S}\right) = 467 + 13{,}908 \left(1 - \frac{V_1}{940}\right)$$

where: V_1 = volume of storage in reach, above pre-failure stage (acre-feet)

S = storage in reservoir before failure (acre-feet)

Q_{p_1} = breach outflow at upstream end of reach

Q_2 = total outflow at downstream end of reach after dam failure

The attenuation of the dam failure wave in the first reach is shown on Graph 5. The stage drops from 10.3' at 109' downstream of the dam to 7.9' at 1,307' downstream of the dam. The estimated attenuation of the failure wave in the downstream tidal basin impact area is as follows:

Distance D/S Dam (feet)	Stage (feet-MSL)
1,307	7.9
2,453	7.5
3,495	7.2
4,485	6.8

Graphs 5-8 show the wave attenuation computations.

The attenuation of the failure wave compares reasonably well with the volumetric comparison of storage in Parker Mills Pond versus the tidal basin above the Sandwich Road bridge (resultant stage 7.3' MSL) and supports the findings that the significant damage due to dam failure would occur in the vicinity of the dam embankment.

Test Flood Analysis

Size Classification: SMALL (storage less than 1,000 acre-feet; height < 40')
Hazard Classification: HIGH (based on some danger of loss of life and economic loss at 2 mill buildings, 4-6 buildings in vicinity of dam embankment, 1 roadway).

According to COE "Recommended Guidelines" the size and hazard classifications of the dam indicate a test flood between a 1/2 PMF and full PMF. Since the size classification is "small" and the height of the dam is low, a 1/2 PMF or a flood approaching that magnitude is used for the test flood.

The drainage area above this dam is characteristic of the southeastern coastal Massachusetts region. The high infiltration and storage capacities in these drainage basins of the Cape Cod region have a tremendous modifying effect on peak flood flow rates. While the USGS regional equations for eastern Massachusetts do not strictly apply to this area, they will yield conservative results as the watershed above Tihonet Pond is characterized by large swampy areas and many cranberry bogs. It is felt that the 500 year peak discharge as computed by the USGS equations will yield a reasonable estimate for a large magnitude storm approaching 1/2 PMF.

Drainage area = 15.2 square miles
Main Channel Slope = 13.1 ft./mile

$$Q_{500} = 82.1 \times A^{0.798} \times s_1^{0.280}$$

$$Q_{500} = 1{,}482 \text{ CFS}$$

The COE PMF curves, by comparison, yield a discharge of 650 CFS/sq. miles for the flat and coastal region. This is a 1/2 PMF of 4,940 CFS for the 15.2 square mile drainage area. This discharge would appear to be quite high after consideration of the extensive storage available in this watershed. The discharge of 1,482 CFS as computed by the USGS equations will be used in the test flood analysis.

AD-A147 084 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS PARKER MILLS POND DAM..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV JUL 81 2/2

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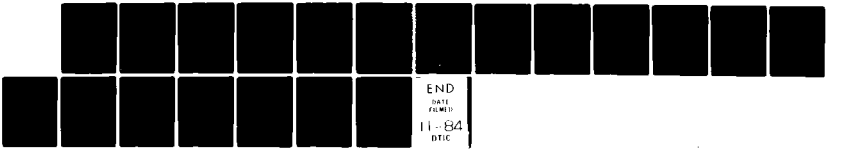

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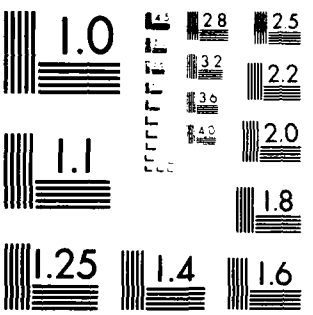


Stage Storage Curve

The storage at normal pool elevation (14,0' MSL from USGS quadrangle map) is approximately 460 acre-feet. The pond surface area at 14.0' MSL is approximately 80 acres as measured from the USGS quadrangle map. The surface area at the 20.0' contour elevation is approximately 270 acres from the USGS quadrangle map so the surface area at 17.5' MSL is interpolated to be 191 acres. The storage is computed as follows:

$$\text{Surcharge Storage} = \left[\frac{80 + 191}{2} \times h\right] = 136 \times 3.5 \approx 480 \text{ acre-feet}$$

$$\text{Total Storage} = 460 + 480 = 940 \text{ acre-feet}$$

The stage-surcharge storage curve is given on Graph 2.

For the drainage area of 15.2 square miles or 9,728 acres:

$$1\text{" of runoff} = \frac{9{,}728(1\text{"})}{12\text{"/foot}} = 811 \text{ acre-feet}$$

$$1 \text{ acre-foot} = 1/811 = 0.0012\text{" of runoff}$$

Surcharge Storage to the top of dam = 480 acre-feet = 0.6" of runoff

The attenuation of the test flood inflow due to surcharge storage in the pond is calculated on Graph 9.

The peak test flood outflow is 1,342 CFS, with a corresponding stage of 18.7' MSL which is 1.2' above the top of the dam embankment. The spillway capacity is inadequate to handle the test flood. The buildings in the vicinity of the dam embankment would probably be affected by the dam overtopping.

Upstream Tihonet Pond Dam Failure

Tihonet Pond is located in the same watershed, approximately 1½ miles upstream of Parker Mills Pond along the Wankinco River. A COE- Phase I Dam Inspection report has been prepared for Tihonet Pond.

The following information is obtained from the Tihonet Pond Phase I-Dam Inspection Report:

Tihonet Pond volume at maximum stage (42.0' MSL) = 1,235 acre-feet

Tihonet Pond - total failure outflow = 18,988 CFS

The effect of a Tihonet Pond dam failure on Parker Mills Pond is estimated using the COE "Recommended Guidelines". A variation of the routing equation is applied to estimate the outflow and corresponding stage of Parker Mills Pond.

$$Q_{p_2} = \text{normal u/s outflow at maximum stage} + Q_{p_1}\left(1 - \frac{V_1}{S}\right) = 234 + 18{,}754\left(1 - \frac{V_1}{1{,}235}\right)$$

where: S = volume of storage, upstream pond prior to failure (acre-feet)

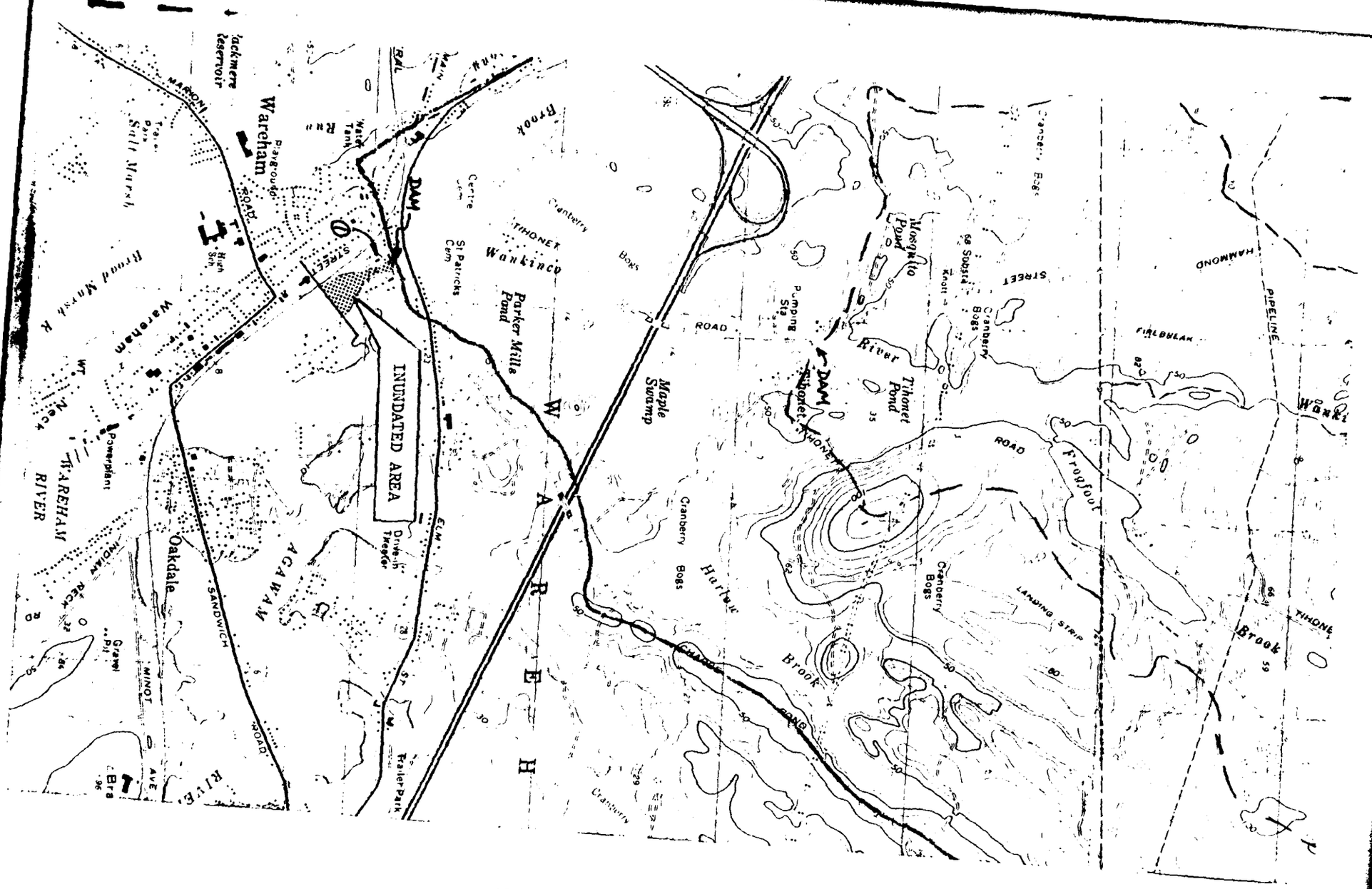
V_1 = surcharge storage in downstream pond (acre-feet)

Q_{p_1} = breach outflow upstream pond

Q_{p_2} = total outflow at downstream pond after upstream dam failure

The attenuation of a Tihonet Pond failure flow by Parker Mills Pond is shown on Graph 10.

The peak outflow is approximately 3,200 CFS at a corresponding stage of 20.0' MSL which is 2.5' above the top of the dam embankment. The spillway capacity is inadequate to handle the Tihonet Pond failure flow. The buildings in the vicinity of the Parker Mills Pond dam embankment would be affected by the dam overtopping.



ASEC CORPORATION

PARKER MILLS POND DAM
WAREHAM, MASSACHUSETTS

1" = 2,083.3'

WAREHAM QUADRANGLE

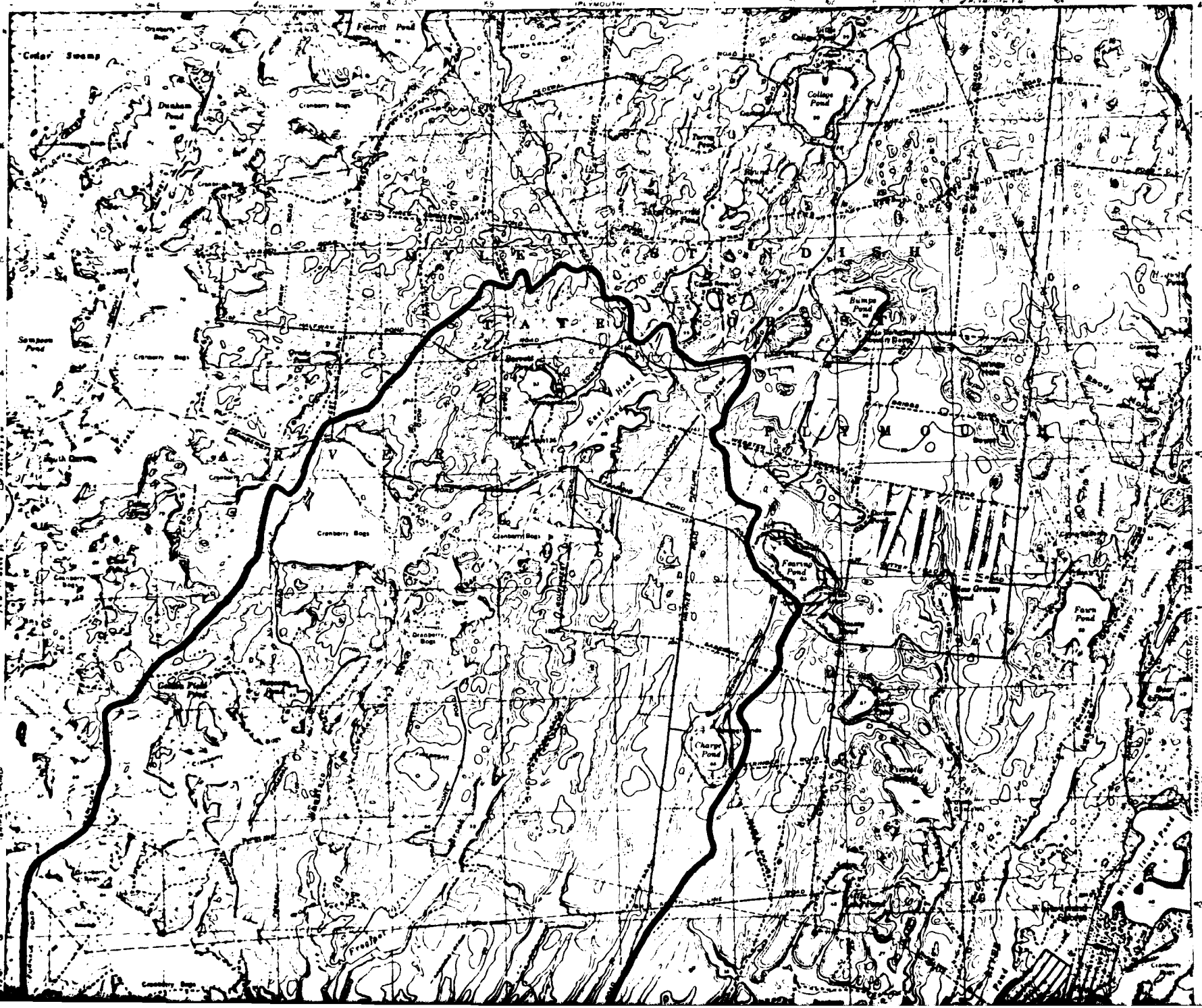
The table below summarizes the downstream effect of failure of Parker Mills pond dam.

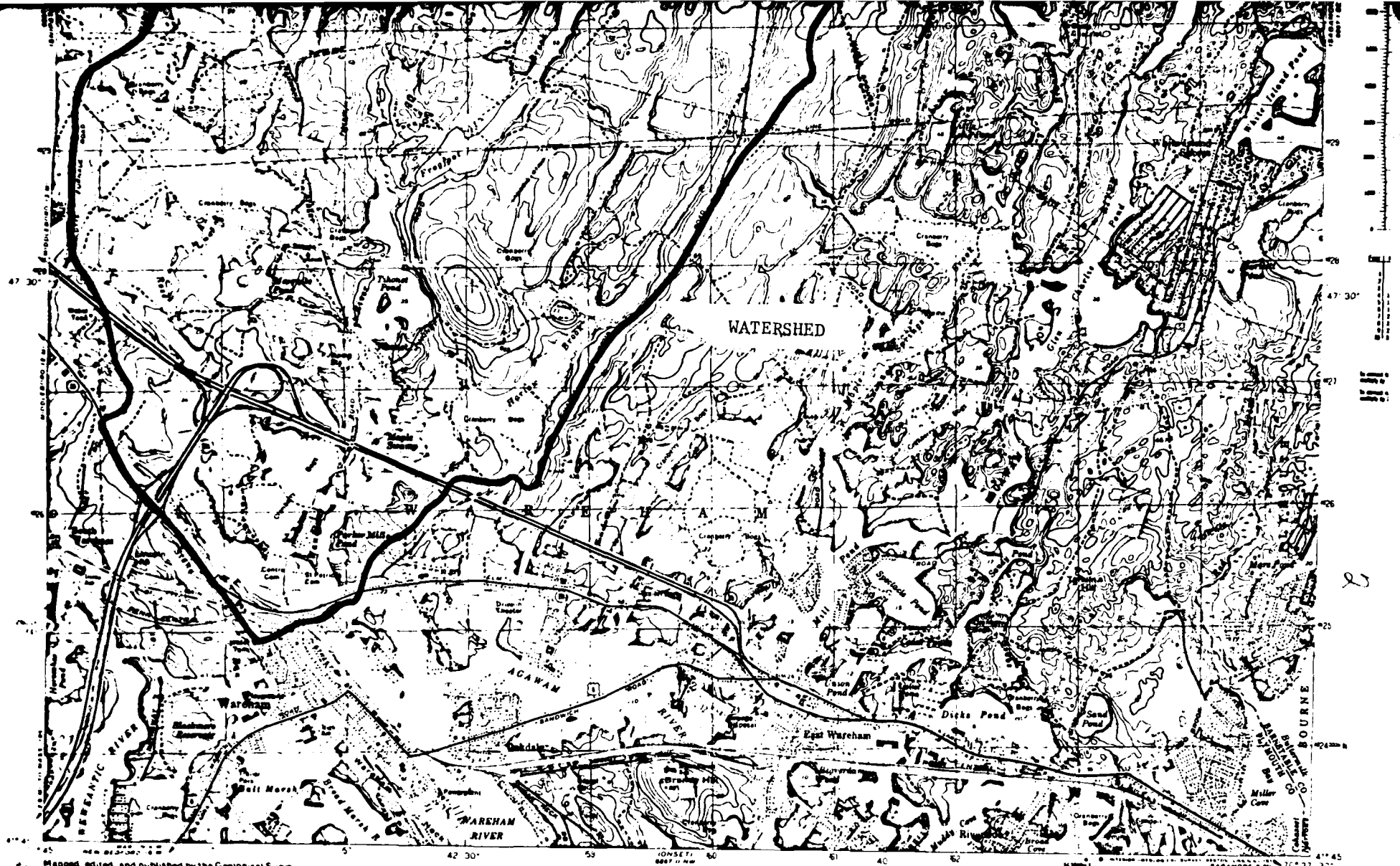
Location no. (see map)	Distance D/S of Dam (ft)	Number of Structures	Level Above Stream (ft)	Flow (CFS) Stage (Ft. above Stream) Before Failure	Flow (CFS) Stage (Ft. above Stream) After Failure	Comments
1	- 109	1 mill building	1.1	467/ 3.5 (flow in channel)	13,908/ 10.3	Major damage to mill building. Significant danger of loss of life. (Location on dam embankment).
		road	0			Probable wash-out. (Location below dam embankment).
		1 house	0			Possible damage to 1 house. Some danger of loss of life (Location below dam embankment).
2	109 - 1307	2 mill buildings	5 - 8	467/5.0	13,334/8.0	Damage to mill buildings. Danger of loss of life.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

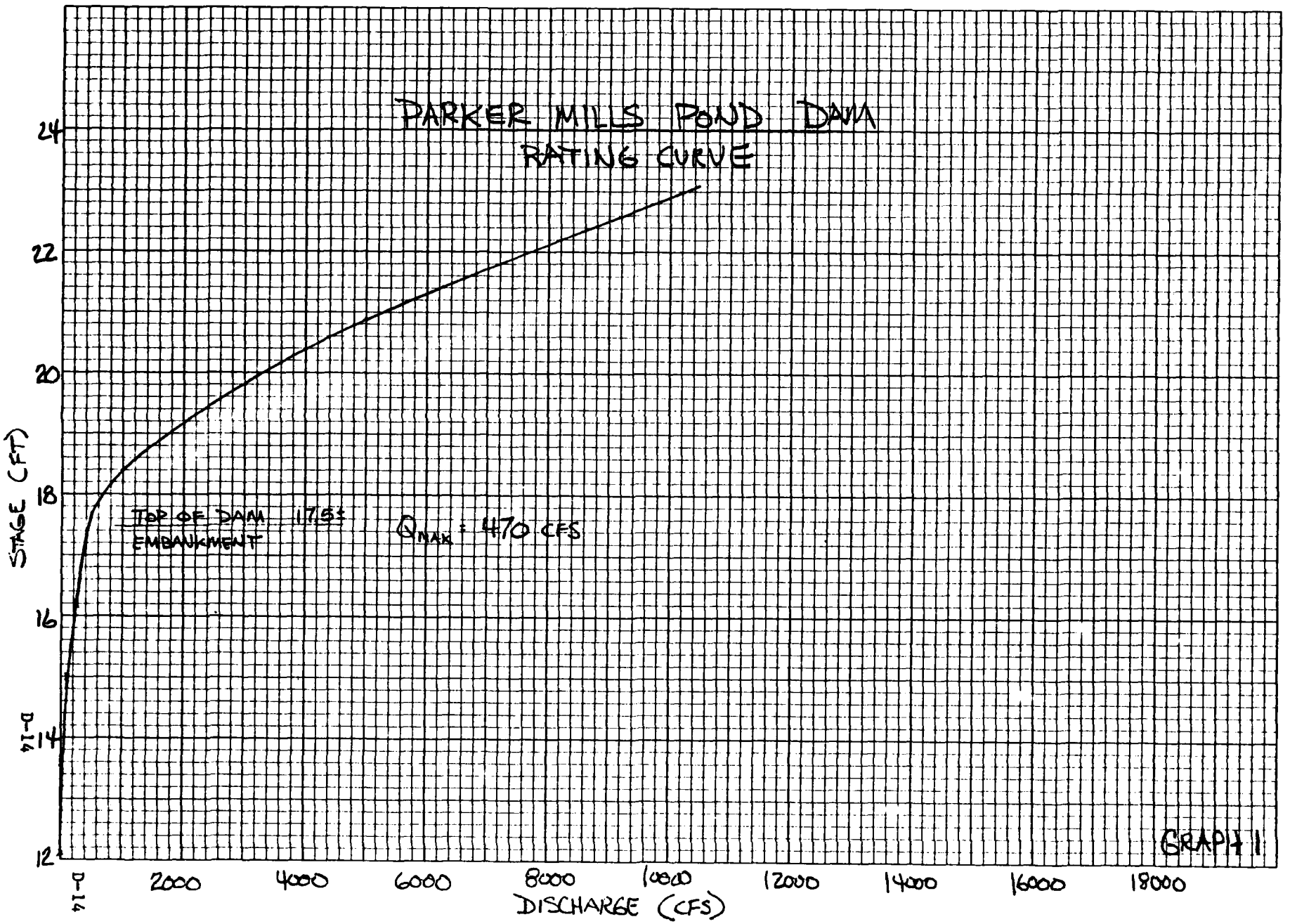
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

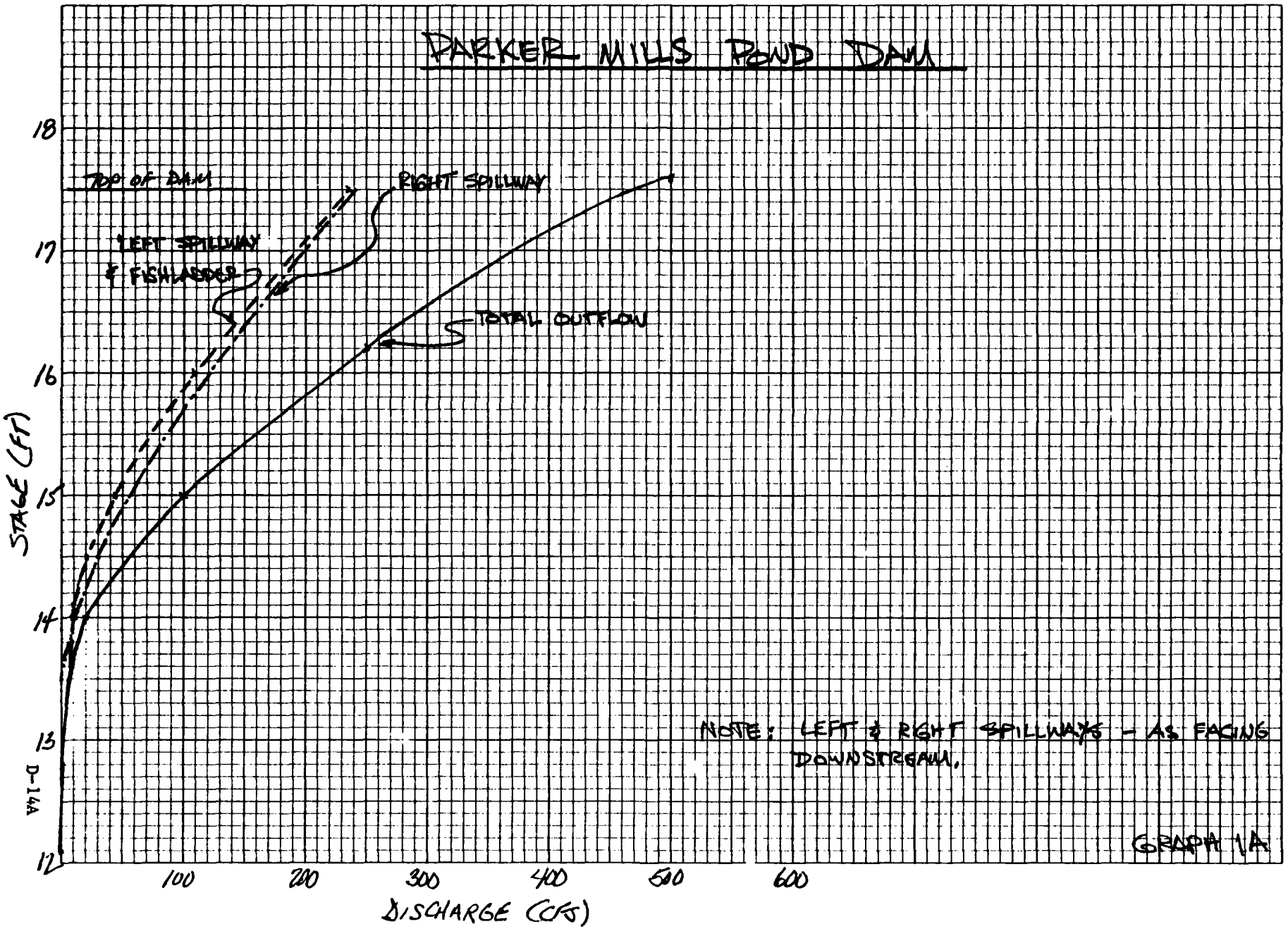
WAREHAM QUADRANGLE
MASSACHUSETTS
7.5 MINUTE SERIES (TOPOGRAPHIC)

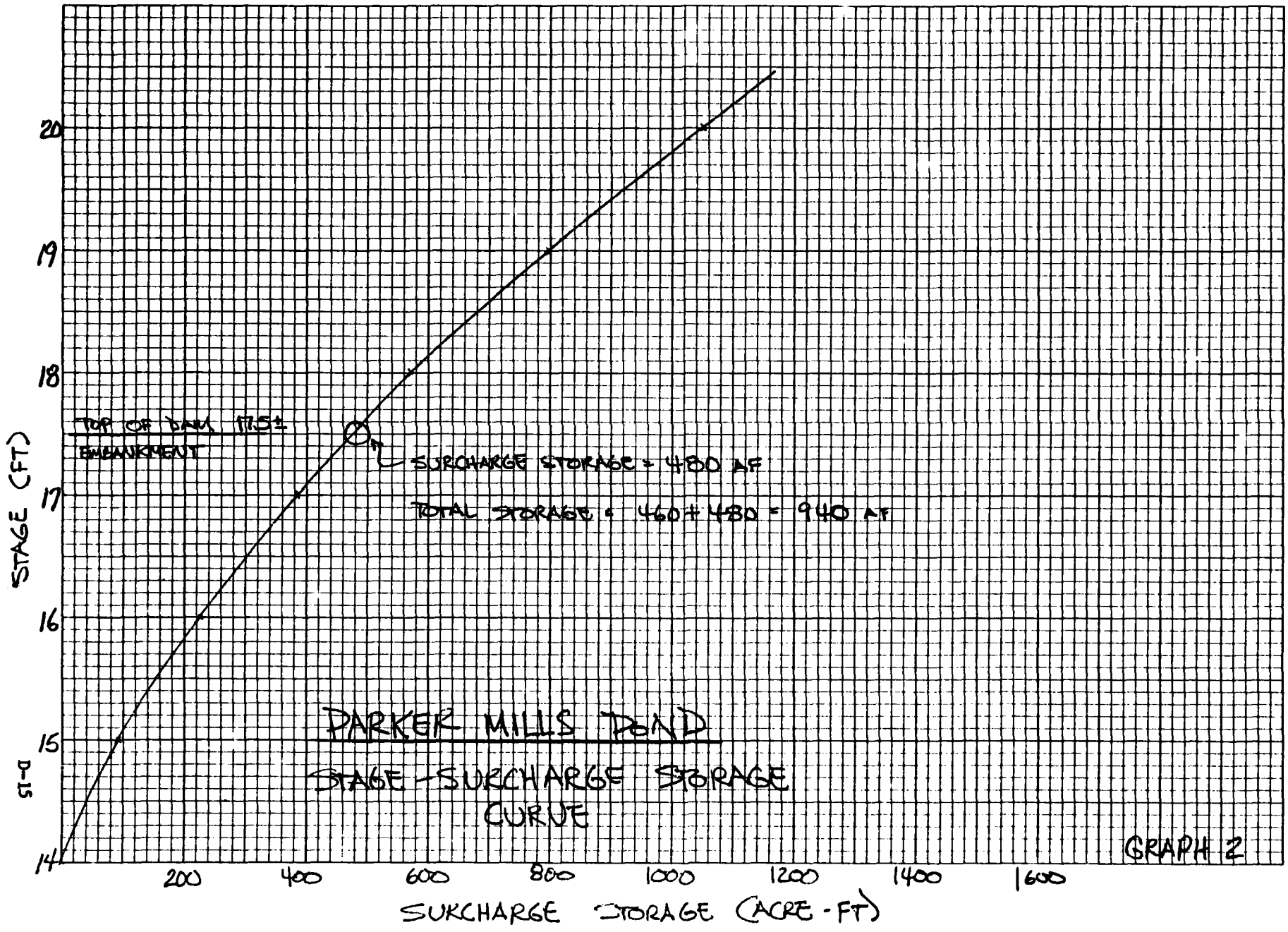


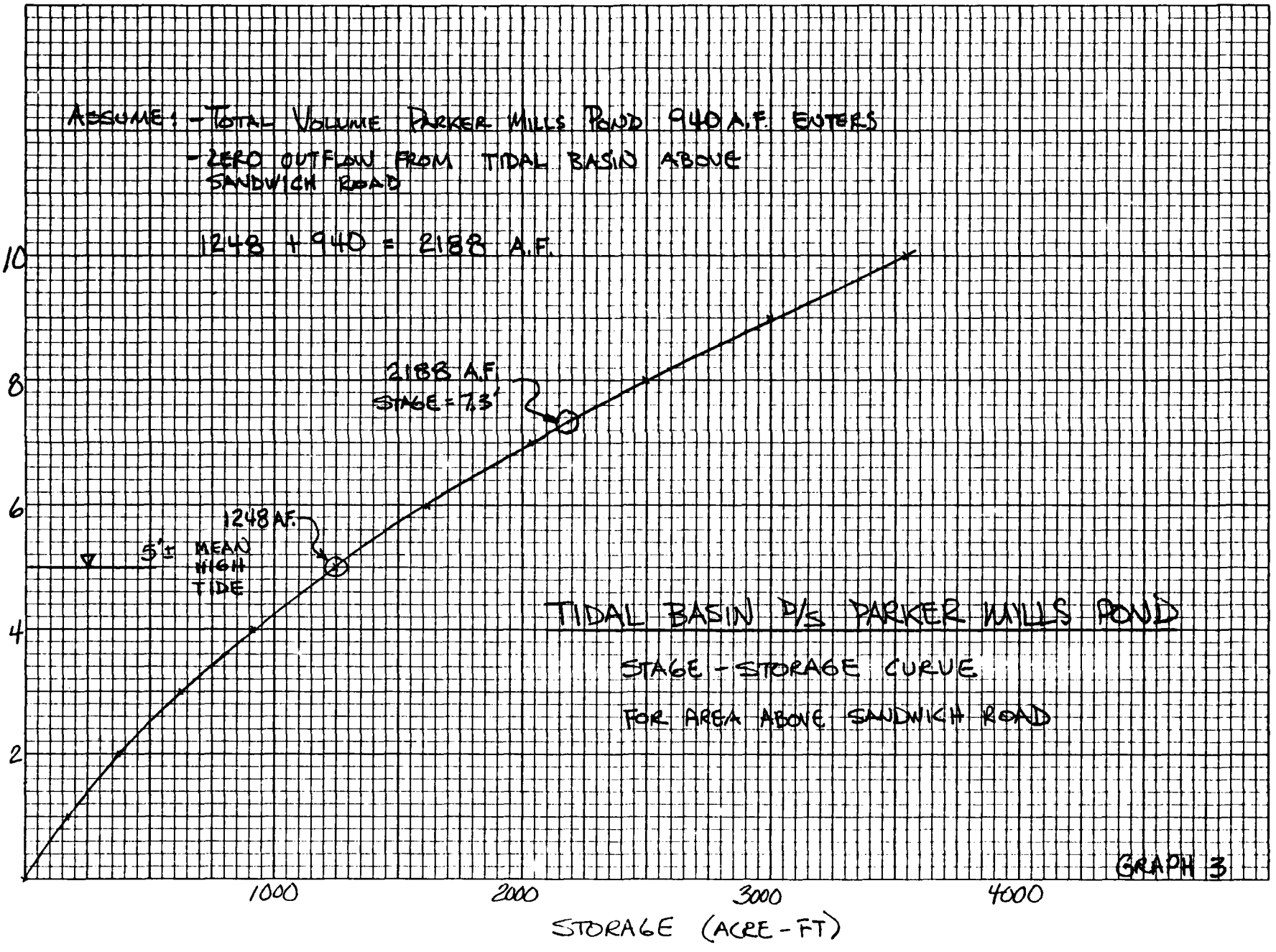


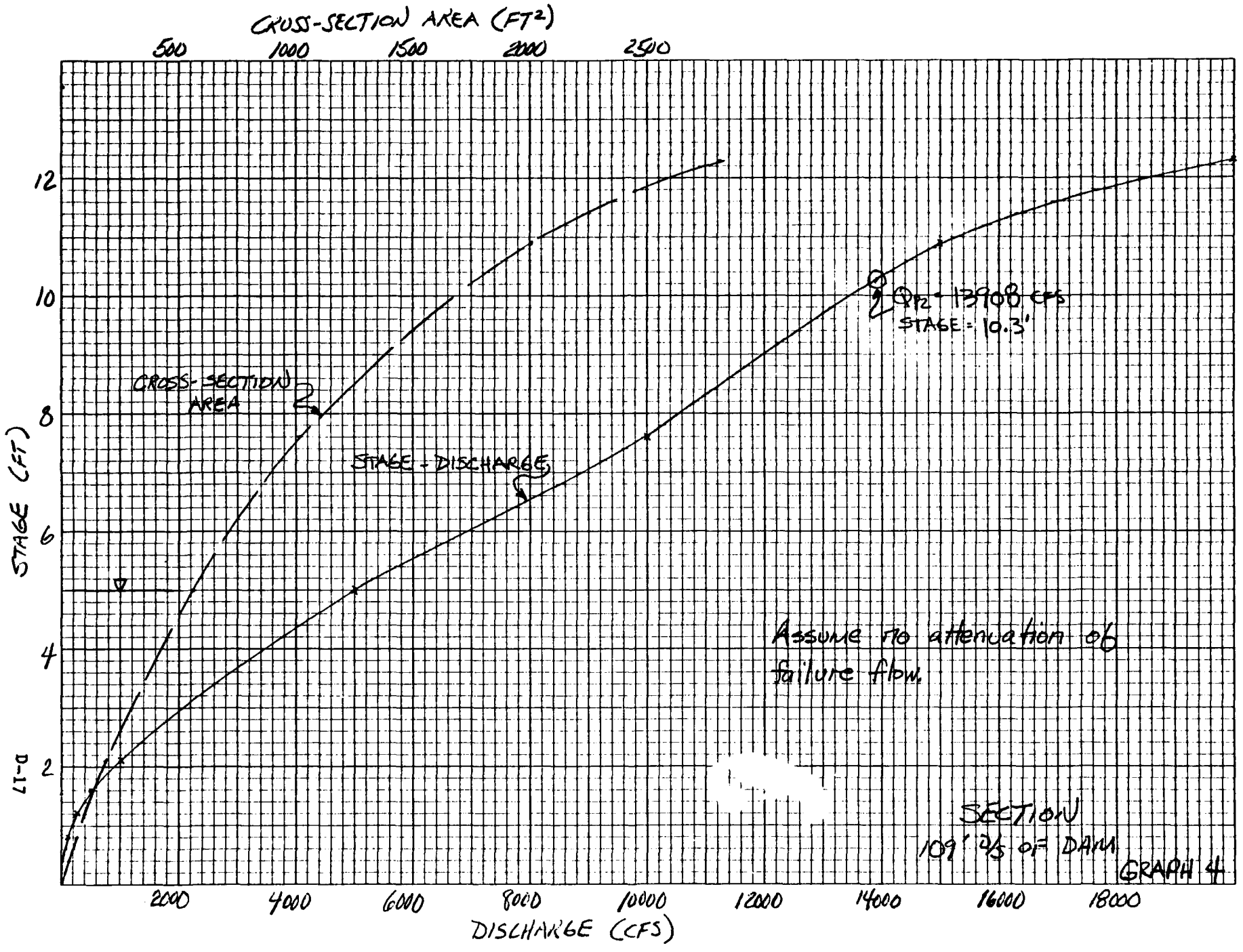
WATERSHED PLAN - PARKER MILLS POND DAM

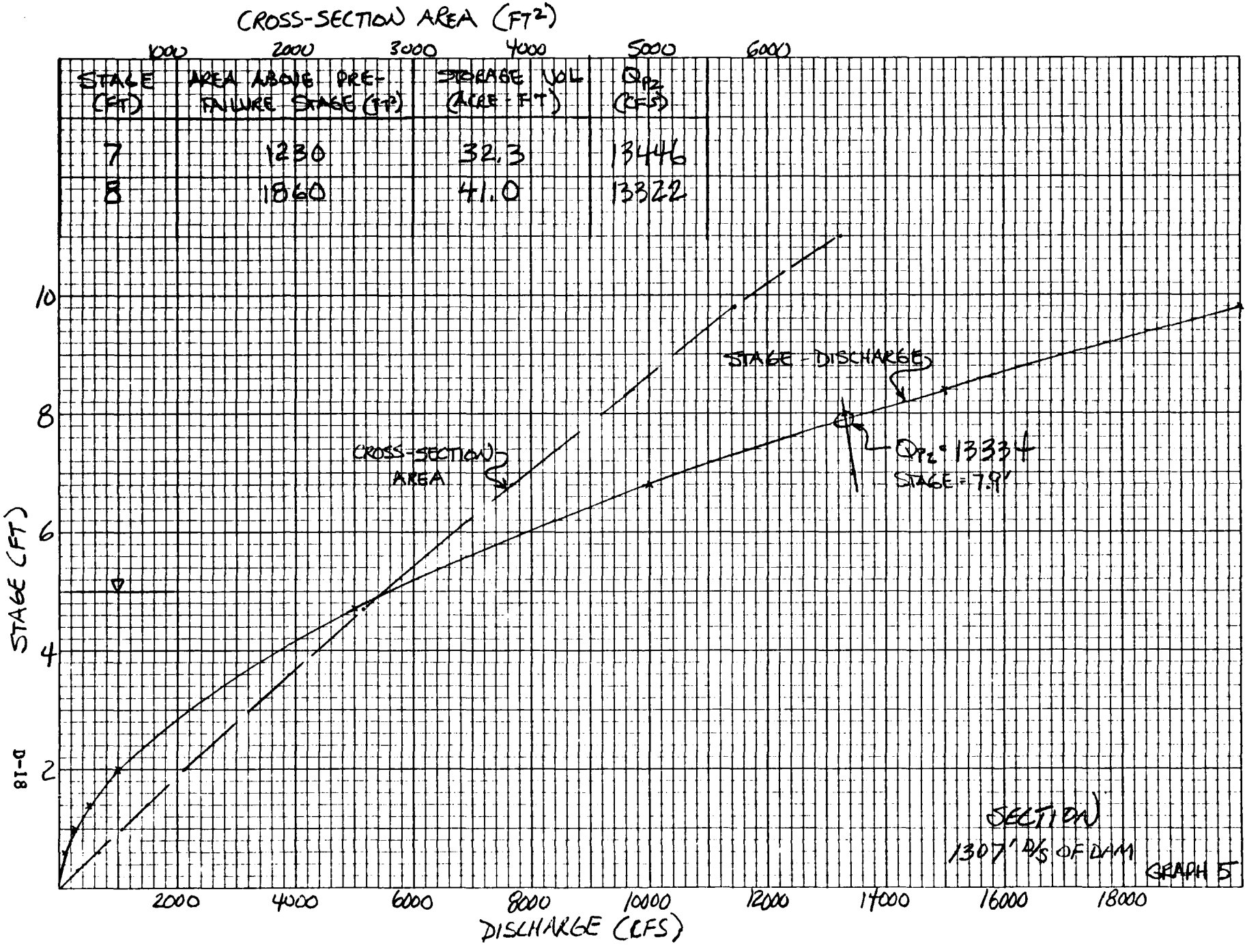












NO. 341-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

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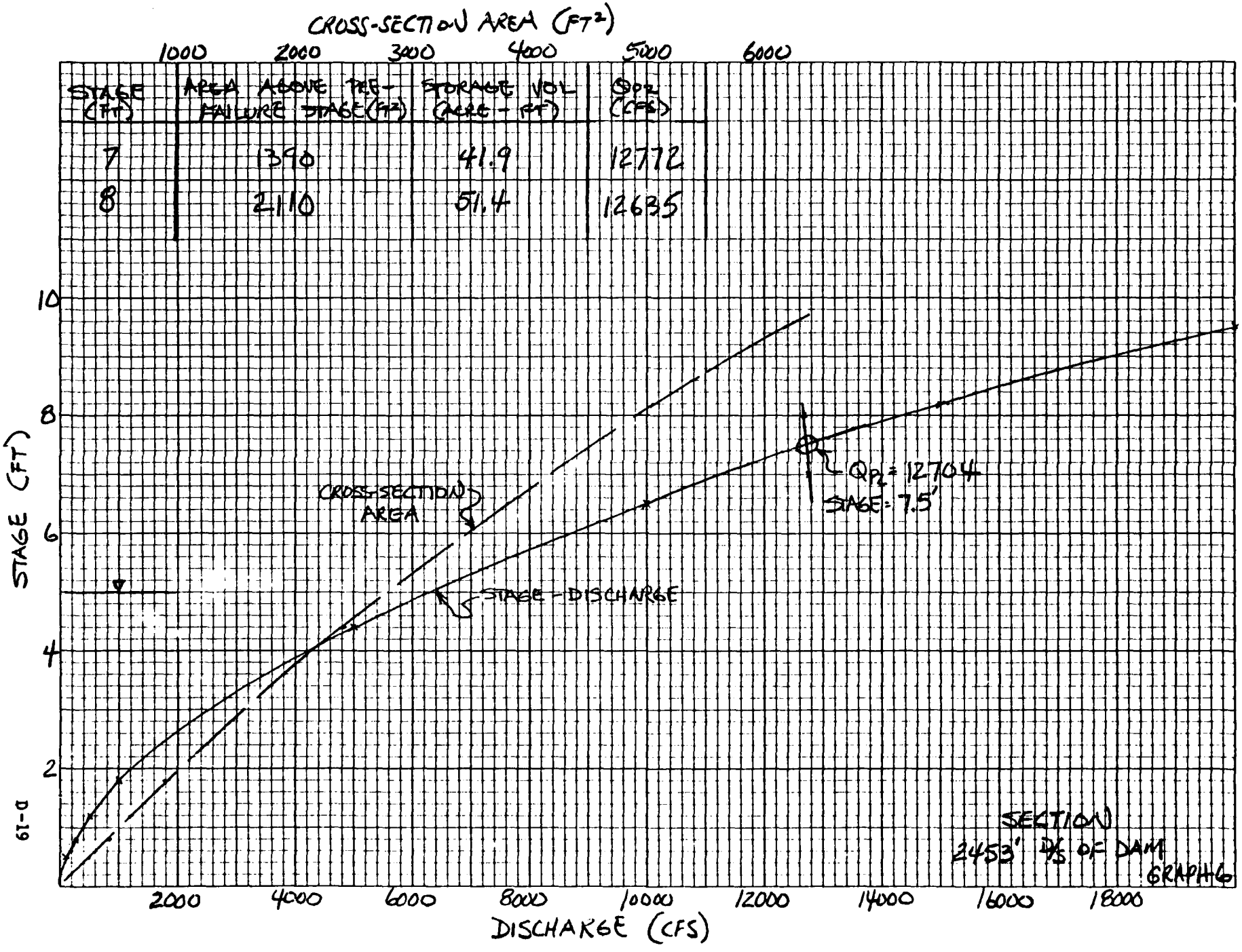

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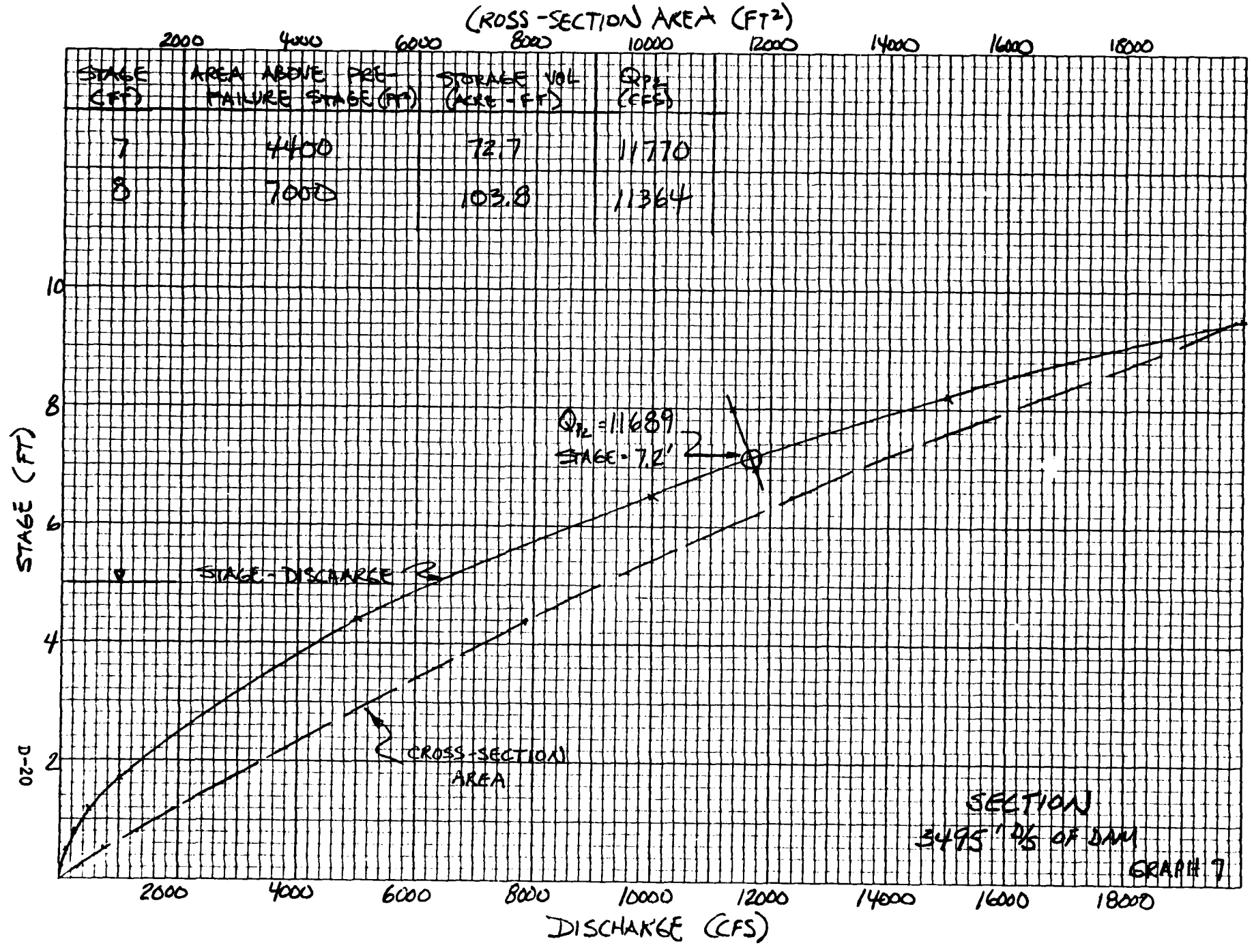
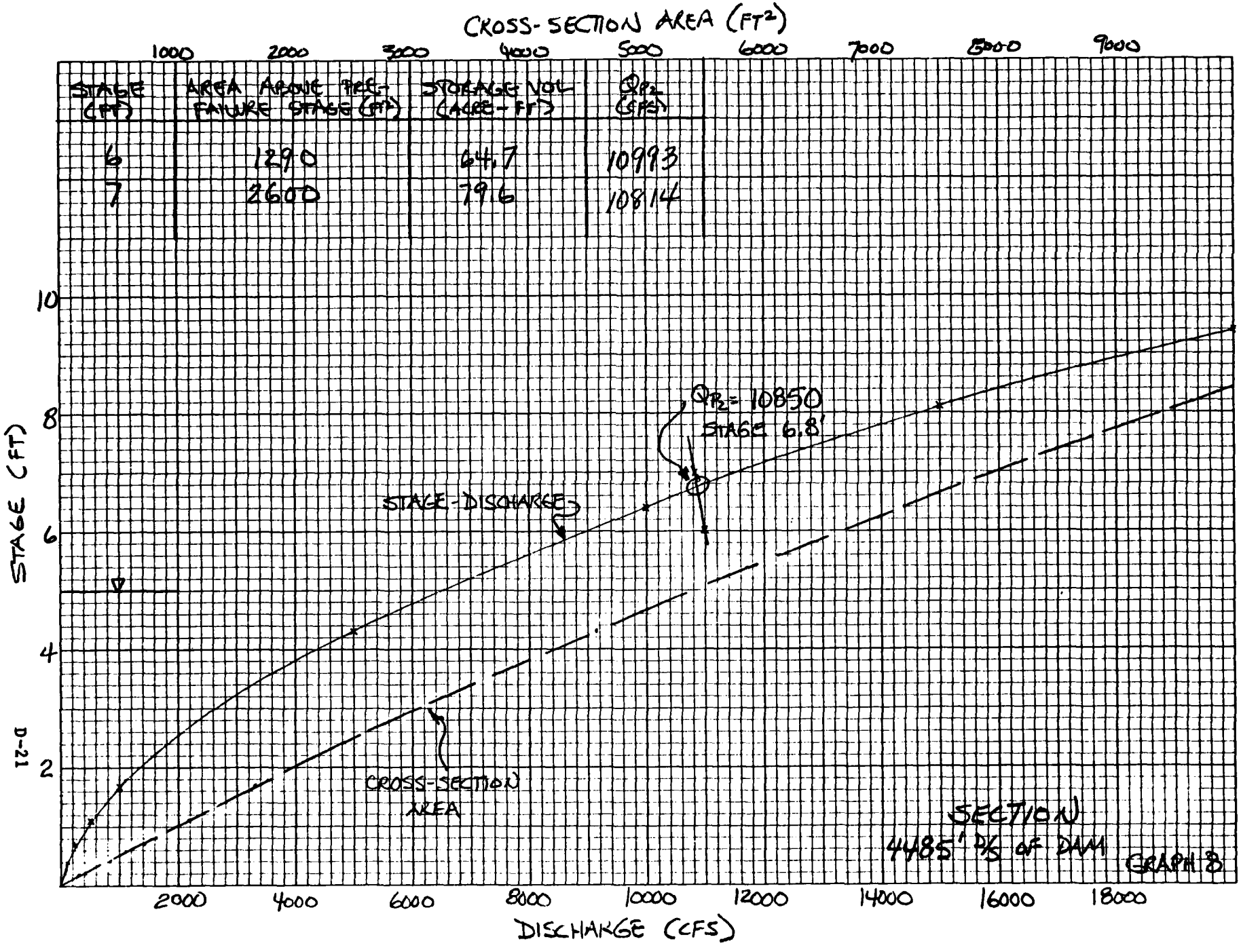
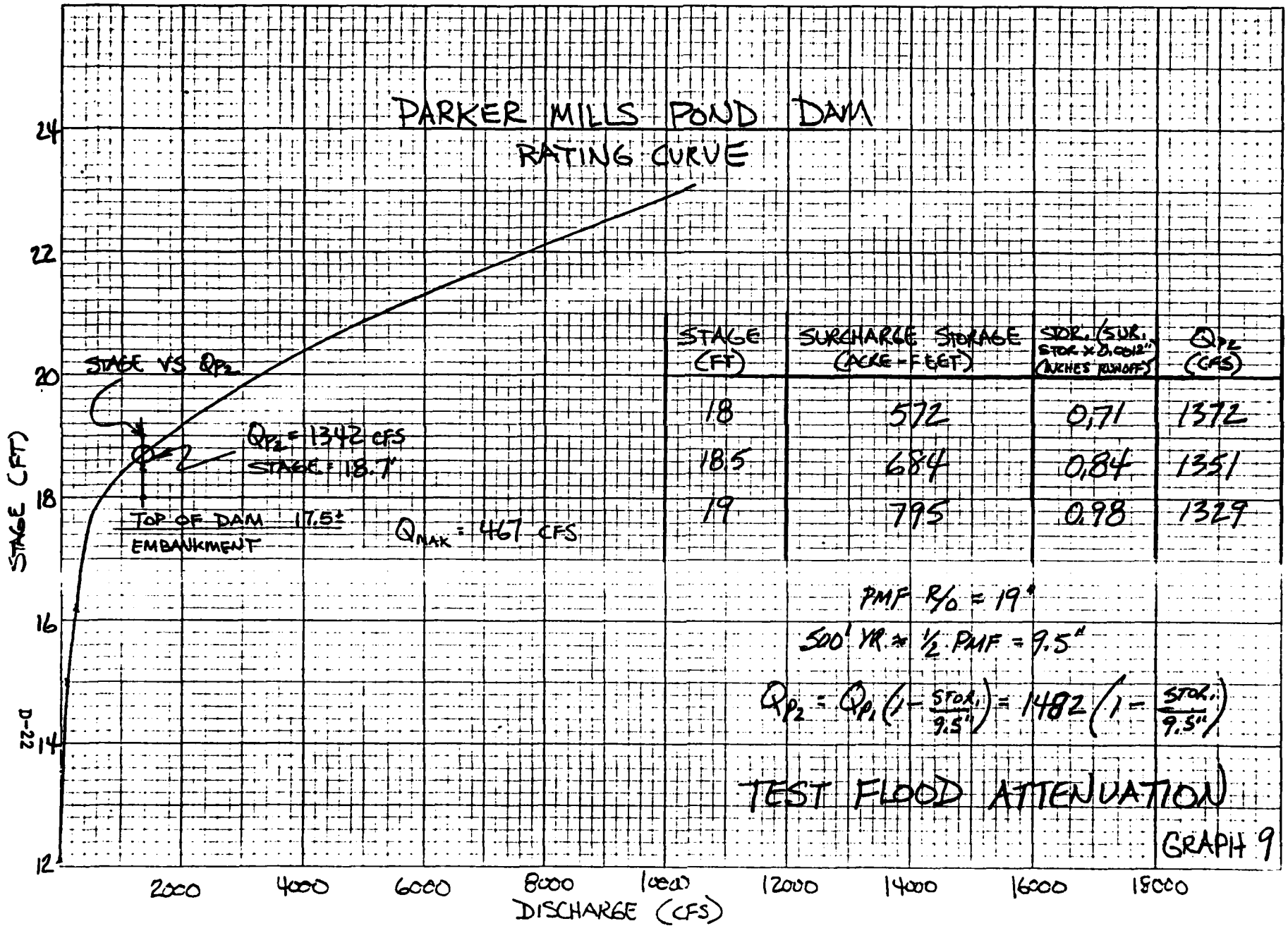






STAGE (FT)	SURCHARGE STORAGE (ACRE-FEET)	STOR./(SUR. STOR × 0.0012" (INCHES RUNOFF)	Q_{P_2} (CFS)
18	572	0.71	1372
18.5	684	0.84	1351
19	795	0.98	1329

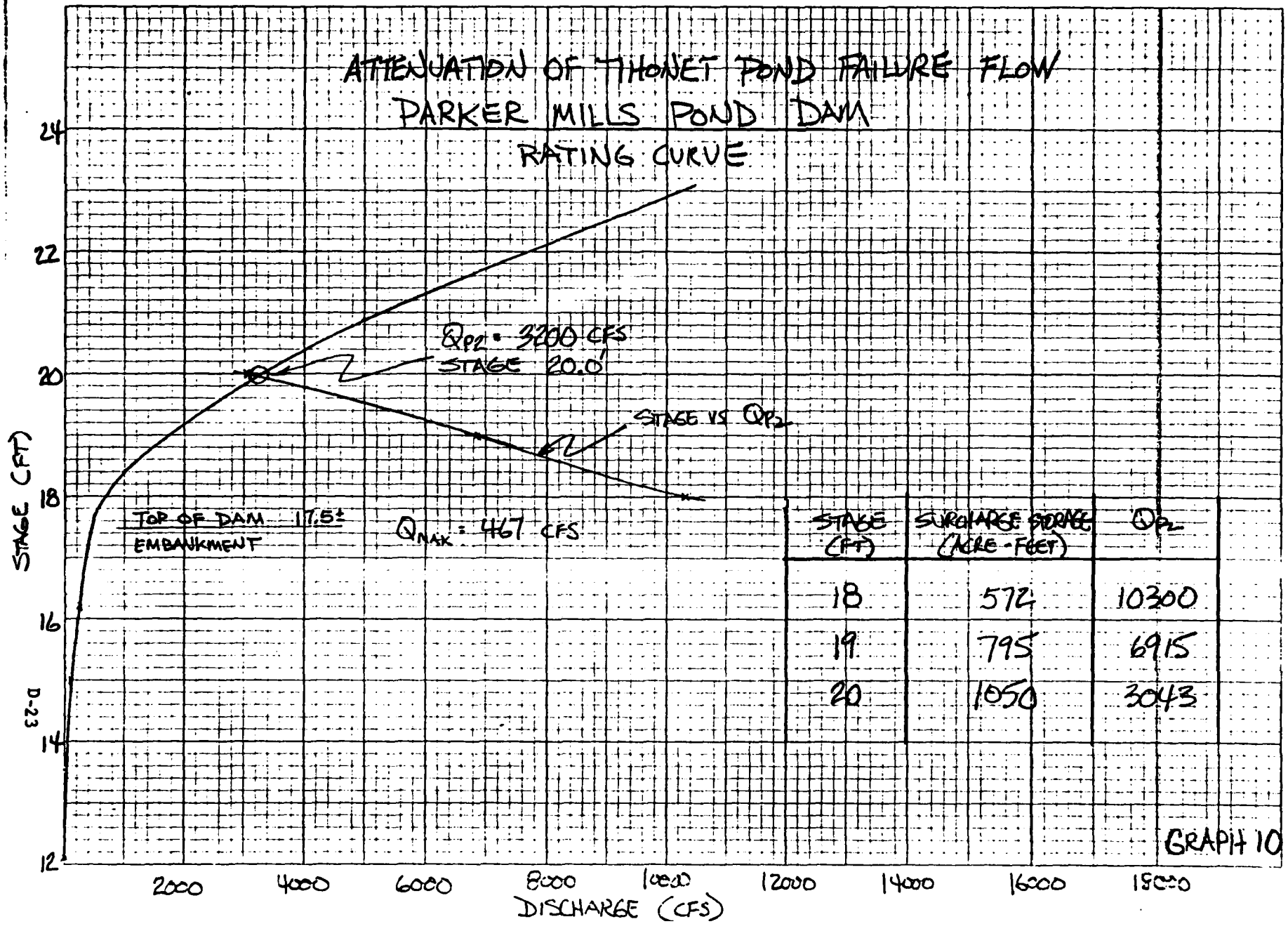
PMF R/O = 19"

500 YR ≈ ½ PMF = 9.5"

$$Q_{P_2} = Q_{P_1}\left(1 - \frac{\text{STOR.}}{9.5"}\right) = 1482\left(1 - \frac{\text{STOR.}}{9.5"}\right)$$

TEST FLOOD ATTENUATION

GRAPH 9



STAGE (FT)	SURCHARGE STORAGE (ACRE-FEET)	Q_{P2}
18	572	10300
19	795	6915
20	1050	3043

GRAPH 10

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME